ROYAL LIBRARY 1990

VOL. LXXXVI. No. 2221. [All Rights Reserved.] JUNE 18 1920 [Registered at G.P.O. as a Newspaper and Canadian Magazine rate of Postage.] PRICE SIXPENCE.

LONDON: PUBLISHING OFFICE, 4, LUDGATE HILL, E.C. 4. SUBSCRIPTION RATES, Postage Free: United Kingdom and Canada, £1 12s. 6d. per annum.; Colonial and Foreign, £2 1s. 6d. per annum.—NEW YORK: D. VAN NOSTRAND CO., 25, Park Place, New York City. TORONTO, ONT.: WM. DAWSON & SONS, LTD., Manning Chambers. PARIS: BOUVEAU & CHEVILLET, Librairie, Etrangère, 21, Rue de la Banque.
Telegraphic Address: "Azeekay, Cent., London." A B C Code. Telephone Nos. City 997: Central 4425 (Editorial only).

LITHOLITE INSULATORS, Ltd.
65—57, Hackney Grove, London, E. 8.
'Phone and Telegrams: Dalston, 592, London.
FIREPROOF AND OTHER GRADES.
ESTABLISHED NEARLY 20 YEARS.

Birkby's **"ELO"**
For all purposes for which moulded insulation is required specify "ELO"—which is water, oil and fireproof.
FLEMING, BIRKBY & GOODALL, LTD., LIVERSEDGE, YORKSHIRE.

WRIGHT 'Phone: 499 Tel.: Motor.
A.C. and D.C. **MOTORS.**
WRIGHT MOTORS, Ltd., HALIFAX.

EVERY DESCRIPTION OF
SMALL TURNED PARTS and CASTINGS for ELECTRICAL ENGINEERS.
A. MORTON,
6, Tenby Street North, Birmingham.

BROOK
ONE, TWO and THREE-PHASE
MOTORS.
See Sup. 46.

SWITCHGEAR
ERNEST F. MOY, LTD.,
Manufacturing Electrical Engineers and Government Contractors.
GREENLAND PLACE, CAMDEN TOWN, LONDON

MICA & MICANITE
TAYLOR & PETTERS, LTD.,
40, Hatton Garden, London, E.C. 1.
'Phone: 4575 Central. See Page ii.

MOTORS. • DYNAMOS.
VICTORIA DYNAMO & MOTOR CO.,
CRAVEN HOUSE,
Kingsway, London, W.C. 2.
'Phone: Gerrard 1345.

CHURTON
SINGLE and POLYPHASE
MOTORS.
T. HARDING CHURTON & CO., LTD.,
Atlas Works, Water Lane, LEEDS.

SKATOSKALO BOILER SCALING TOOLS.
Sole Maker:
FRANK GILMAN,
9, Westfield Road, BIRMINGHAM.
See Advertisement this week, page xxxiii.

"EMPIRE"
AUTOMATIC CONTROL
FOR
Pumps, Compressors, Machine Tools.
ELECTRIC CONTROL, LIMITED, GLASGOW.

WESTERN-ELECTRIC
COMPANY, LIMITED,
Norfolk House, Victoria Embankment, W.C. 2
Works: NORTH WOOLWICH, LONDON, E.
TELEPHONES & CABLES.
See Advertisement last week, p. vi.

CONNOLLY'S (BLACKLEY), Ltd.
for
WIRES AND CABLES.
See Advertisement this week, p. iii.

WHITE
Electrical Instrument Co., Ltd.
2, 4 & 6, GLOUCESTER ST., CLERKENWELL, LONDON, E.C. 1.
Wire: Voltograph, London. 'Phone: City, 8800.

ELECTRIC MOTORS.
One, Two and Three-Phase.
BRITTAIN'S ELECTRIC MOTOR Co.
(Late Langdon-Davies Electric Motor Co.),
110, Cannon Street, London, E.C. 4.

INSULATING -- BEADS --
Immediate Delivery.
HOLDER-HARRIDEN LTD., 35(37, Noble St., London, E.C.

Concerning Catalogues.
See page xl.

Better than Rubber, Leather and Gutta-Percha.
PACKING RINGS.
DERMATINE
DERMATINE CO., Ltd.,
Neate St., London, S.E. 5

SHUNT REGULATORS.
MOTOR STARTERS and all classes of Resistance Work.
REPAIRS TO ANY MAKE **MOTOR STARTERS.**
THE SOLENOID REGULATOR CO.,
BIRMINGHAM SQUARE, CAMP HILL.
Telephone: Midland 681. BIRMINGHAM. Telegrams: "Solenoid, Birmingham."

MAVOR & COULSON, Ltd.,
GLASGOW.
MOTORS, DYNAMOS, SWITCHGEAR.

ELECTRIC MOTOR REPAIRS.
ARMATURES REWOUND.
H. DUNN & SON,
Newington Causeway,
Tel.: Hop. 1167. LONDON, S.E. 1

RAYNER & HEALD, LTD.,
DUKE STREET, DERBY.
TWO & THREE-PHASE MOTORS only.
See page xxxi.

FULLER'S UNITED ELECTRIC WORKS, LIMITED,
MANUFACTURERS OF
ACCUMULATORS BATTERIES
WIRES & CABLES CARBONS, &c.
WORKS: CHADWELL HEATH, ESSEX.
General Sales Offices:
IDDESLEIGH HOUSE, Caxton St., Westminster.
'Grams Bioobat, Vic, London. 'Phone: Victoria 6863.

INGLEBY & Co.,
ELLAND ROAD, LTD.
MOTORS LEEDS.
FOR DIRECT AND ALTERNATING CURRENT Tel. 373.
Delivery from Stock up to 50 H.P.

Advertisement Index, see page xxxii.

ENGLISH
EDISWAN
EVERYTHING
ELECTRICAL

The house of Ediswan is the best equipped to deal with all enquiries for
Everything
Electrical.
ENTIRELY BRITISH.

The Edison Swan Electric Co., Ltd.
PONDERS END, MIDDLESEX.
London and Provincial Depots.

"CANTIE"
SWITCHES

THE
CANTIE SWITCH CO., Ltd.
HAVE REMOVED TO THEIR
NEW WORKS,
LEIGHTON STREET,
NOTTINGHAM.

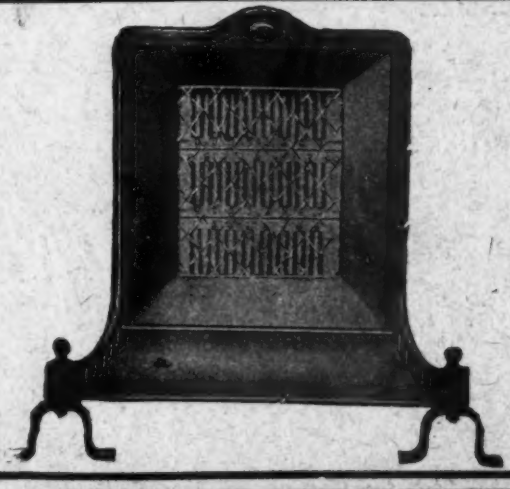
Enquiries solicited for

IRONCLAD SWITCHES
CHANGEOVERS
SWITCH FUSES
IRONCLAD FUSEBOARDS
SWITCHBOARDS
CONTROLLER GEAR

MICA & MICANITE

INSULATORS FOR EVERY DESCRIPTION OF ELECTRICAL WORK.
Contractors for Air Board, War Office and Admiralty Requirements.
CUTTING AND GAUGING OUR SPECIALITY.
BEST QUALITY MICA ONLY.

'PHONE 4575 CENTRAL.
TELEGRAMS—"MICAYLOR, LONDON."
TAYLOR & PETTERS, LTD.,
40, HATTON GARDEN,
LONDON, E.C. 1
(The Oldest Established Mica House in the country.)
AND ALL BRITISH.



THE
ARORA ELECTRIC FIRE
Has given universal satisfaction.
WHY? Because OUR patented Element is of HEAVY SECTION and has LOW Current Density, yet it GLOWS at a HIGH TEMPERATURE.
Low Price, Robust, Cheery, Economical.
Write for List E (Fires & Cookers) to Sole Manufacturers:
THE ARORA CO., Loughborough.
(Proprietors: Measures & Co., Ltd.)

Telephone: CITY 3115. Telegrams: VANDIANA CENT LONDON
Contractors to H.M. Government.
ELECTRICAL INSULATING TAPES, WEBS, CORDS, SLEEVING, &c.
DELIVERY FROM STOCK.
JOHN MACLENNAN & CO.,
113, NEWGATE STREET, LONDON, E.C. 1. AND AT 166, INGRAM STREET, GLASGOW.

THE

ELECTRICAL REVIEW.

VOL. LXXXVI. JUNE 18, 1920. No. 2,221.

ELECTRICAL REVIEW.

Vol. LXXXVI.] CONTENTS: June 18, 1920. [No. 2,221.

	Page
The I.M.E.A. Convention	769
The Transport Position in Paris	770
Electrical Training for Women	770
Power Developments in U.S.A.	770
Distribution Mains for New Housing Schemes, by H. Wilson (*illus.*)	771
Charging Electric Battery Hand Lamps, by G. J. Duckett (*illus.*)	773
The I.E.E. (Scottish Centre) Visit to Kinlochleven (*illus.*) ...	774
New Electrical Devices, Fittings and Plant (*illus.*)	776
Legal...	777
Correspondence—	
German Representation	778
Box Numbers	778
"What is the Contractor Doing?"	778
The Chief and the Staff	778
Fault Localisation	779
Composition *v.* Porcelain Insulators	779
"Situations Vacant"	779
Non-Union Labour and Supply Undertakings	779
Business Notes	780
Notes...	787
City Notes	789
Stocks and Shares	791
Market Quotations	792
Where America Lags Behind	793
The Design of a Super-Power Station, by H. Goodwin and A. R. Smith (*illus.*)	794
Economical Supply of Electric Power in the U.S.A. (*illus.*) ...	798
Reviews	798
Exports and Imports of Electrical Goods for May, 1920 ...	800
New Patents Applied for, 1920	800
Abstracts of Published Specifications	800
Contractors' Column ... ... Advertisement page xxiv	

"ELECTRICAL REVIEW" SUBSCRIPTION RATES.

UNITED KINGDOM and CANADA £1 12 6 per annum.
COLONIAL and FOREIGN .. .. 2 1 6 do.

Postage Free.

THE ELECTRICAL REVIEW.

Published every FRIDAY, Price 6d.

The Oldest Weekly Electrical Paper. Established 1872.

TO BE OBTAINED BY ORDER FROM ANY NEWSAGENT IN TOWN OR COUNTRY.

OFFICE:—4, LUDGATE HILL, LONDON, E.C. 4.

Telegraphic Address: "AGENCY, CENT., LONDON." Code, A B C. Telephone Nos.: City 997; Central 4425 (Editorial only).

The "Electrical Review" is the recognised medium of the Electrical Trades, and has by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

FOREIGN AGENTS:

ADELAIDE: Messrs. Atkinson & Co., Gresham Street.
AUCKLAND N.Z.: Gordon & Gotch, Albert Street; Peter G. Tait, P.O. Box 392.
BRISBANE: Gordon & Gotch, Queen St.
CHRISTCHURCH, N.Z.: Gordon and Gotch, Manchester Street.
DUNEDIN, N.Z.: Gordon & Gotch, Princes Street.
JOHANNESBURG, CAPETOWN, BLOEMFONTEIN, DURBAN, PORT ELIZABETH, &c. Central News Agency, Ltd.
LAUNCESTON: Gordon & Gotch, Cimitiere Street.
MELBOURNE: Peter G. Tait, 90, William Street; Gordon & Gotch, Queen Street.
MILAN: Fratelli Treves.
NEW YORK: D. Van Nostrand, 25, Park Place.
PARIS: Boyveau & Chevillet, 22, Rue de la Banque.
PERTH, W.A.: Gordon & Gotch, William Street.
ROME: Loescher & Co., Corso Umberto 1° 307.
SYDNEY: Peter G. Tait, 273, George Street; Gordon & Gotch, Pitt Street.
TORONTO, ONT.: Wm. Dawson & Sons, Ltd., Manning Chambers; Gordon and Gotch, 132, Bay Street.
WELLINGTON, N.Z.: Gordon & Gotch, Cuba Street.

Cheques and Postal Orders (on Chief Office, London) to be made payable to THE ELECTRICAL REVIEW, LIMITED, and crossed "London City and Midland Bank, Newgate Street Branch."

THE I.M.E.A. CONVENTION.

THE convention to be held at Bradford, next week, under the presidency of the city electrical engineer, Mr. Thomas Roles, meets under rather unusual circumstances; its headquarters are at Ilkley, in charming surroundings, but those very charms have made the district so popular that the summer population in normal times taxes its resources to the utmost, so that the influx of some hundreds of additional visitors attending the convention has almost reduced the accommodation available to "Standing Room Only," and has brought home to the residents the reality of the housing problem in its acutest terms. However, Mr. Roles, who during the last few years has acquired an extensive and peculiar experience of dealing with overloads of 100 per cent., or more, can be relied upon to cope with the new peak load thus laid upon his shoulders. We understand that the members' quarters are distributed over a fairly wide area, not only in hotels and boarding houses, but also in private apartments, and that even the latter are at a premium. As the local train service is somewhat indifferent, some inconvenience to members is unavoidable, but we are sure that they will not allow this to detract materially from their enjoyment of the occasion.

Papers on the design of distributing networks, by Mr. C. A. Gillin (Bradford), and power station design, by Mr. I. V. Robinson (of the B.E.A.M.A.), will afford abundant scope for technical discussion, and one on the standardisation of tariffs by Mr. J. W. Beauchamp (of the E.D.A.) will give an opportunity for the Committee members to join in the debate; they will be taken as read, a procedure which we have long advocated, so that the whole time of the meetings will be available for the discussions. The programme of visits, excursions, and receptions will command general approval, and, granted fine weather, the Convention ought to compare favourably with any of its predecessors.

Besides the subjects above mentioned, the municipal engineers and managers will have plenty to discuss, whether *tête-à-tête* or in open meeting. Both the Committee members and the engineers at their sectional meetings will doubtless be interested in the schedules of salaries which have recently been in the public eye, and now the Trade Unions have thrown down a new challenge which, although at the moment restricted to the Greater London area, is bound ultimately to affect the whole country. The Unions' claim is simple and comprehensive; in effect, they demand that non-union labour shall have no place in the electricity supply industry, in the service of either supply authorities or contractors, and they fix a time limit expiring on July 1st for the decision.

This act on the part of the Unions raises two very important questions: first, the operation of the Whitley Council system, and, secondly, the question whether a British citizen is entitled to earn his living without belonging to a Trade Union.

With regard to the former, while it is to be regretted that an agreed decision could not be arrived at in the bosom of the Joint Industrial Council, and that one "side" of the Council should feel called upon to act independently, we do not think the fact indicates the failure of the system. The machine is of very recent construction, and has hardly "found itself" yet; nevertheless, excellent work has already been accomplished by the Whitley scheme, and if it drop a stitch now and then, it does not follow that the scheme is inherently faulty. We believe that as conditions improve,

and the adjustments and lubrication of the mechanism are perfected, harmony will prevail over discord, and the system will work smoothly. In the meantime, the right to strike being inalienable, the Unions cannot be expected to forgo the use of this weapon to press their views when a deadlock is reached on the Council.

As regards the second question, however, we strongly disapprove of the action of the Unions. The question is in no respect one of urgency, and there was no necessity whatever to resort to the big stick in order to compel an immediate decision. Moreover, we must emphatically protest against the claim implied, that every tradesman must belong to a Trade Union. It is true that the Government policy, as embodied in the Whitley Council scheme, favours the extension of the Trade Union principle, as well as the association of employers, because by no other means is it possible to organise a rational system of representation and a channel for negotiation; but, on the other hand, it leaves to every man the right to decide whether he shall or shall not join a Trade Union, a right which is as inalienable in a free country as the right to strike. We earnestly hope that there will be no yielding on this point; to accept tyranny and call it peace is not the way to industrial salvation, and we strongly commend the subject to the attention of the Convention.

Another item that will arouse debate is the bombshell thrown by the Sheffield Town Council into the electricity supply industry. The Council, overriding the advice of the Electricity Committee and the city electrical engineer, has decided to adopt the same rate of charging for both lighting and power. This is a consummation to which all station managers have long looked forward wistfully—but is the time yet ripe for so drastic a proceeding? No doubt the question will crop up in the discussion on Mr. Beauchamp's paper, and we look forward with interest to the views that will there find expression.

The Transport Position in Paris.

The situation of the transport undertakings in France, as a consequence of the war and its resulting developments, is not materially different from that in other countries which have been directly involved in the war, particularly in Paris and the Department of the Seine in general. Notwithstanding the increases in fares which have been sanctioned by the responsible authorities, it is impossible for most of the electric railways and tramways to balance expenditure and income owing to the enormous advance in working expenses through the rise in the prices of all kinds of raw and semi-finished materials, augmentations in wages, the introduction of the eight-hour day, and the consequential employment of a larger body of men and other matters. If any profits are earned, the amount is too small to affect the accumulated deficits of previous years. The Metropolitan Railway reports a further deficit for 1919, whilst the inconsiderable profits of the Nord-Sud Railway last year do not prevent the deficit from growing still further, although each is able to pay a small dividend as a result of financial arrangements with the City of Paris. In the case of the tramways in Paris and the Department of the Seine, the companies have been living for a year past under a system of loans, the City of Paris and the Council of the Seine covering the deficits incurred. This method was introduced in order to permit the Municipal Council and the General Council to pursue the question of the purchase of the various tramway networks and their reorganisation in the general interest, particularly with regard to the facilities of communication to be established between Paris and the outskirts. In this connection M. Dausset, President of the Commission des Transports, has just informed his colleagues of the course of the discussions which have taken place with the companies. He states that it appears possible for an agreement to be reached with some of them on the basis of a friendly purchase. It is expected that the systems will be unified under one company, in which the responsible authorities will be jointly interested. At least, this is the impression gathered from the statement attributed to the President of the Commission.

Electrical Training for Women.

With the characteristic enterprise of the nation one of the Western agricultural colleges in the United States has announced a course in electrical study for young women, which will teach the repair of household electrical appliances. Amongst the subjects to be taught are the localisation and replacement of blown fuses, the repair of broken appliances and lamp cords, the care and simple repair of washing machines, care and operation of home lighting plant, and other problems that are apt to arise.

This is a subject of much interest, and the innovation is one that is worthy of careful consideration in this country, for with the increasing use of domestic electrical devices, the majority of which are used by the lady of the household, some knowledge of the care and maintenance of the apparatus should be taught her.

Perhaps the E.D.A. and other parties interested have not lost sight of the fact that the adoption of such methods would lead to a better understanding of the possibilities of the various appliances, which, with better treatment, would last longer.

Such a course of study would not only be beneficial to the housewife, but also to the electricity supply authority and the dealer in such appliances; for, with better understanding, more would be sold and more electricity used.

It should not be difficult to formulate some such scheme in this country. An educational campaign would abolish the timidity with which most women regard electricity, and restrain a few of the bolder souls who, by their ignorance, cause so much unjustified censure to fall upon the industry.

Power Developments in U.S.A.

Elsewhere in this issue we give particulars of a design for a 300,000-K.V.A. steam-electric generating station which, we believe, may be regarded as embodying the latest American ideas on super-power stations. At the present stage of progress, whatever the future may have in store, the main features of a large power station are fairly stereotyped, and variations must be looked for only in the general arrangement, the selection of known methods and apparatus, steam pressures and temperatures, &c.; nevertheless, there is considerable scope for improvement on current practice, and in several respects the proposed design differs materially from its forerunners. It will be noted that the steam pressure in this case is 350 lb. per sq. in., superheated 350° F., so that the maximum temperature of the steam is about 780° F., near the melting point of zinc. The heated air from the turbo-generators is fed to the boilers, and the economisers are supplemented with pre-heaters, while the jet condensers of the separate "house" turbines are operated with the condensate from the main turbines—a novel scheme. The boilers also present new features, tending towards simplicity, and overhead coal storage is reduced to a minimum.

It is interesting to observe that the generating sets are of 35,000-KW. rating. It is very questionable whether it is advisable, on the score either of economy or expediency, to concentrate much more than this in a single set, even in the largest station.

In the course of a discussion on the development of electric power supply before the American I.E.E., also reported in our pages to-day, it was claimed that the kilowatt-hour could be generated with a consumption of less than 1·5 lb. of good coal with generators of 60,000 to 75,000 KW., and station outputs up to 500,000 KW. were considered, with transmission lines operating at 250,000 volts. Such proposals are exceedingly interesting, and we believe that they afford a true indication of the magnificent prospects that lie before the electrical engineering industry, not only in the United States, but in this country also.

DISTRIBUTION MAINS FOR NEW HOUSING SCHEMES.

By H. WILSON, Mains Superintendent, Maidstone.

MOST mains engineers have during the last year had put before them a block plan of a new estate comprising anything up to two or three hundred houses, and have had to consider the best arrangement of mains to supply these houses with electricity.

This should be to them a problem requiring careful consideration, and at the same time, an opportunity. A problem, because at the least initial cost they have to give the best possible service, not only for immediate needs, but with an eye for possible requirements during the life of the mains which they are laying. It should be an opportunity, because never before have we had, so to speak, a clean slate to start on. Hitherto we have had to make the best of mains "already laid"—and often not laid with a view to ease in maintenance. We have had up to now to deal with houses built in pairs, with often a great uncertainty as to the future development of the roads in which they are erected. We now have to deal with complete estates—with the concentrated accumulation of six years' building. This gives us a much better chance to strike out from the old approved methods, and to profit by the difficulties which we have encountered in the past years.

The demand of the estate in question will probably make it impossible to supply from distributors already in the neighbourhood, and will usually mean a new feeder from the generating station or the nearest sub-station. The nature of the feeder will, of course, depend on the type of generating plant in use at the works, but the suggestions set out below will apply either to a direct or alternating current supply. If the supply undertaking is fortunate enough to have an E.H.T. supply for outlying districts, the feeder will take the form of a 3-core, H.T. feeder finishing up in a static sub-station, which should be as nearly as possible in the centre of the new estate.

Now, assuming that the supply is to be given by means of a 3-phase, 4-wire system, with the consumers connected between one phase and the neutral, a four-conductor main in each street is a clumsy arrangement, and unnecessarily complicated. It is a difficult main to connect service cables to, and, when the houses have been connected in equal numbers between each of the three phases and the neutral, there is no control of the balance of the phases, *i.e.*, of the relative load on each phase. In the early days of the supply, with only lighting in use, this will be quite satisfactory, but with the gradual installation of heating and cooking apparatus in some of the houses, the system will inevitably get out of balance, and there will be no easy means of correcting this.

As an alternative system the laying of a two-conductor distributor along the front of each row of houses has many advantages; moreover, if the main is dipped in and out from house to house, the main and service cables can be combined, and all underground joints and T-boxes can be dispensed with. This calls for a special cut-out on the consumers' premises which replaces the usual T-box on the main and the ordinary two-pole cut-out usually fixed.

A brief consideration of the accompanying diagram—which is of an actual housing scheme now under construction—will be better than a great deal of description.

"S" is a static sub-station from which three feeder cables are taken to feeder boxes A, B, and C, situated in the rectangular bases of lamp columns. The feeder cables are not shown on the diagram, in order to avoid confusion with the distributor cables which are. Each feeder cable consists of a concentric cable with two conductors, the outer being a 0.1 sq. in. conductor connected to the neutral point of the transformer, and the inner being a 0.2 sq. in. conductor supplied from one phase. The copper has been cut down in the neutral conductor, as when the system is in a state of balance this conductor should carry no current, and the neutral conductors are inter-connected at each of the distribu-

The four points marked "L" are 4-way distribution boxes also situated in lamp column bases.

In the case of the 24 houses marked in groups as D, E, F, G, and H, the distributor which is dipped in and out from house to house is a .022 sq. in. twin, paper, lead, armoured cable laid direct. All other distributors consist of 0.05 sq. in. twin cables of similar construction.

Should the distributors become overloaded due to increased load for cooking and heating, it is proposed to extend the feeder cables from the points A, B, and C, to the four distribution boxes marked "L."

The advantages to be claimed for the system here set out may be summarised briefly as follows:—

1. It gives a permanent control of the balance because the area supplied by each phase can be altered by adjustment of the links in the lamp column distribution bases or in the houses.

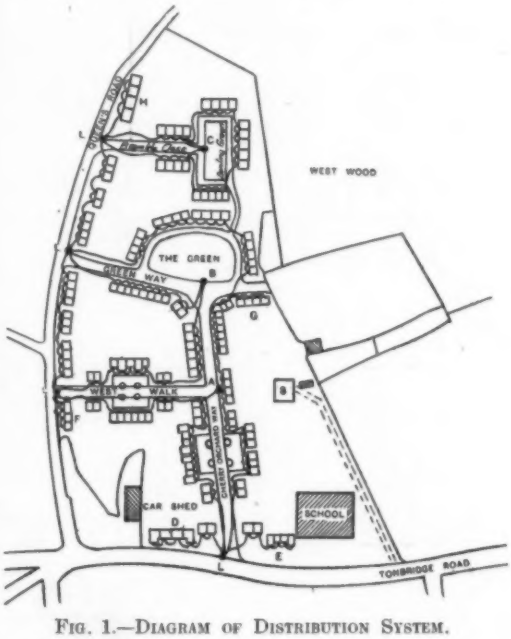


FIG. 1.—DIAGRAM OF DISTRIBUTION SYSTEM.

2. It gives a duplicate supply to most of the houses, as by "feeding" from two ways a faulty length of cable between two houses can be disconnected without opening the ground, and can be dispensed with for the time being, without leaving any consumer disconnected.

3. It gives great accessibility to the mains, in the event of a fault developing anywhere on the network. Mains engineers will appreciate the fact that they can get at both ends of a faulty length for testing purposes without opening any ground. It also provides great facilities for rapidly localising any fault which may occur, and for the restoration of the supply. With the advent of electric cooking this will be more important than it has been in purely lighting districts. At the points on the estate where a duplicate supply is not available, that is, where it is impossible to feed from both ends, it is very easy to replace a faulty length with a temporary overhead cable and so restore the supply for the time being, and in this event it is not necessary to open the ground to clear the fault before the supply can be restored to consumers past the point of breakdown.

4. The system as set out should be fairly immune from breakdowns. It has been the author's experience that faults do not often occur in the middle of lengths of armoured cable laid direct, but usually at points at which the cables have been worked, such as service T-boxes or joints.

5. By the use of armoured cables laid direct, a large proportion of unskilled labour can be used in the installation.

6. It gives the full capacity of the main in each house.

Apart from the question of supply to the new houses, the following points should be kept in mind in the design of the sub-station:—

1. Space should be left for spare H.T. cubicles so that in the future the H.T. supply can be extended further afield with a minimum expense and disturbance of existing arrangements.

The static sub-station which the author has in mind is one of several distribution points on a partly completed H.T. loop main. It is hoped eventually to complete this loop main back to the generating station through other distribution points so as to have a duplicate supply at each point. It would then be possible to cut out any one section of the loop and still supply at all points.

2. Space should be left either for increasing the size of the transformer or for putting in an additional one. The probable increase in the heating and cooking demand in the next few years is a debatable matter, but the least we can do is to allow for a substantial increase for these purposes.

3. Where old mains supplying adjoining districts run anywhere near the new sub-station they should be diverted into it where possible—even if they are direct current mains—as it may be desirable to take them over on to the new supply at some future date. In the author's own case, a three-wire D.C. distributor passes within 200 yards of the new sub-station, and this will probably be taken in and out of the sub-station with a view to changing over to an A.C. supply on account of increasing load and distance from the generating station.

It is suggested that the two D.C. "outers" up the road, and the two "outers" down the road will make four circuits which can be balanced up with the new houses on the 3-phase supply. The 3-phase voltage, one phase to neutral, is 230 volts with 400 volts between phases, while the D.C. voltage is 230 volts outer to neutral, and as the district in question is a residential one without large power consumers, it is hoped to accomplish the change-over without much disturbance other than the changing of the consumers' meters. It should be kept in mind that under modern conditions most power is generated as A.C., and if it can be distributed as such it saves loss both in conversion and distribution.

The cut-out box used in the houses replaces the ordinary cut-out and also the T-box used on the main, and must therefore be of special construction (fig. 2). The first batch of these had to be made during the moulders' strike, and consisted of rectangular boxes 15 in. by 7 in. by 4 in. deep, made of stout sheet iron and treated with a preservative paint. The front of the box is removable, and is made in two sections. The bottom of the box consists of a rectangular hard-wood bush grooved on two sides so as to slip into the sheet metal box. This bush can be cut through the middle so that the front half can be slid in after the cables are in position. The bottom section of the metal front, which is 4 in. in height, forms the front of the sealing trough, and is held in position by two set-screws. It is not put in until the work on the cables is completed, so as to give every facility to the cable jointer when opening out the cables. The fittings in the cut-out box consist of two horizontal 1 in. by $\frac{1}{8}$ in. copper strips as shown, the top one being the live conductor, the lower one the neutral. The top bar is set 2 in. further back in the box than the bottom one, so that the conductors coming up to it shall clear the bottom bar. The bars are supported on hard-wood blocks, from which they are insulated by an ordinary meter board insulator and mica washers.

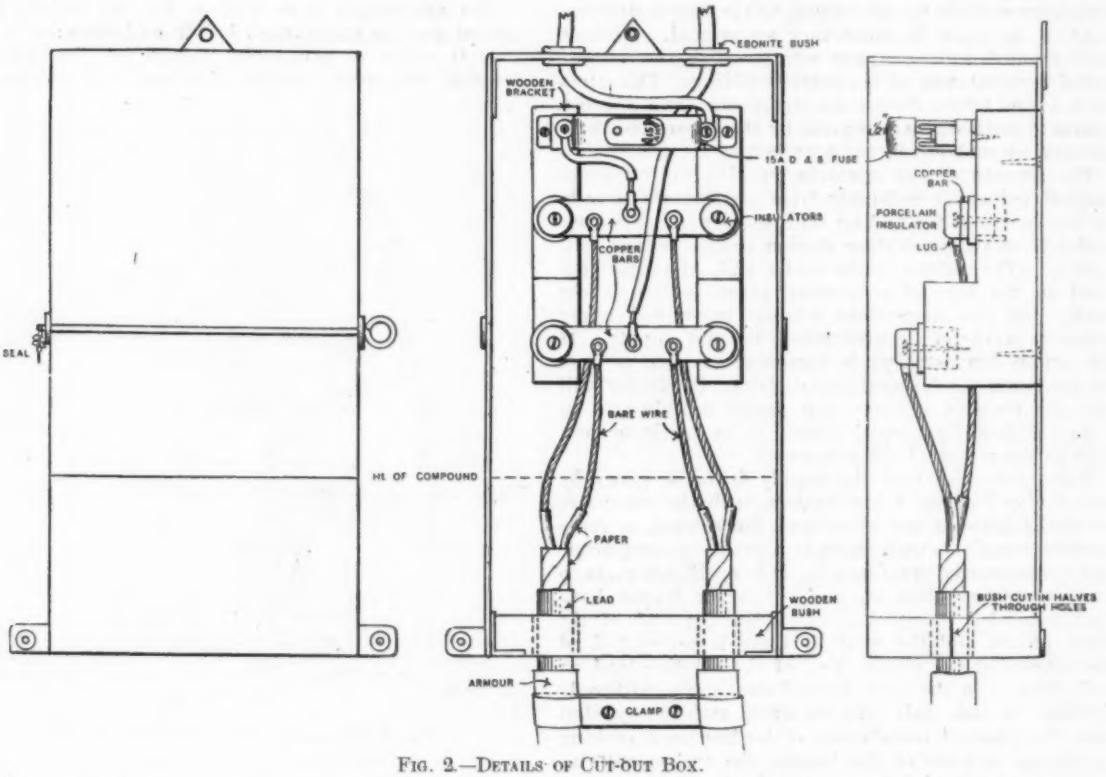


FIG. 2.—DETAILS OF CUT-OUT BOX.

Each cut-out will take if necessary three .05 sq. in. twin cables, which permits of any cut-out being used practically as a three-way box. It is proposed to run all street lamp services from the nearest house by means of a .013 two-core paper, lead, armoured cable taken off the bars in the cut-out.

The lamp columns are of the usual type of small

column except that the bases for 18 in. above the ground are rectangular and are 12 in. by 10 in. The underground portion or root is made as a separate casting, and the column will be lifted on to this and secured by four bolts after the sealing ends and rubber tails have been put on the incoming cables. The bars in the lamp columns will be arranged and supported as in the consumers' cut-outs, and the feeder cables will run with the distributors on to these bars. There will be no fuses other than those on each phase in the sub-station, it being the author's experience that fuses in distribution boxes, unless under constant inspection, have to be set at such a high value to avoid overheating, that they seldom operate satisfactorily when required, and if set only slightly above the working current they are very likely to operate through overload and age, when not required to do so.

All cables will be carefully labelled at the start by means of a stamped zinc label attached to the rubber tails below the bars, and a tracing showing position of all feeders and distributors on the estate will be framed and hung up ready for reference, in the sub-station.

As previously stated, spare ways will be left in all feeder and distribution boxes so as to extend the feeders to the distribution boxes should the future developments require it.

Since writing the above, prices and particulars of a cut-out on the lines indicated for dipping cables in and out, have been received. These prices compare very satisfactorily with the combined cost of an ordinary cut-out and T-box, and the fact that a cut-out of this description will very shortly be on the market for immediate delivery in large quantities, should make the dipping-in system very popular with those responsible for the mains and services to the new housing schemes.

CHARGING ELECTRIC BATTERY HAND LAMPS.

By G. J. DUCKETT.

The charging of electric battery hand lamps is usually done in a more or less happy-go-lucky way; users of lead-plate sulphuric-acid cells do not appreciate their delicacy, of which there is no gainsaying, but acid cells properly charged and used (that is, not allowed to stand discharged, when sulphation sets in and causes disintegration of the positive plates and swelling of the material, eventually bursting the celluloid case, and resulting in total destruction of the cell) are a most reliable type of electrical apparatus. The writer forsees a great future for the small-capacity electrical storage battery, and therefore a few remarks on the system of charging he has devised may be of some value to those who intend utilising electric lamps in lieu of the old-fashioned gas or oil hand lamps.

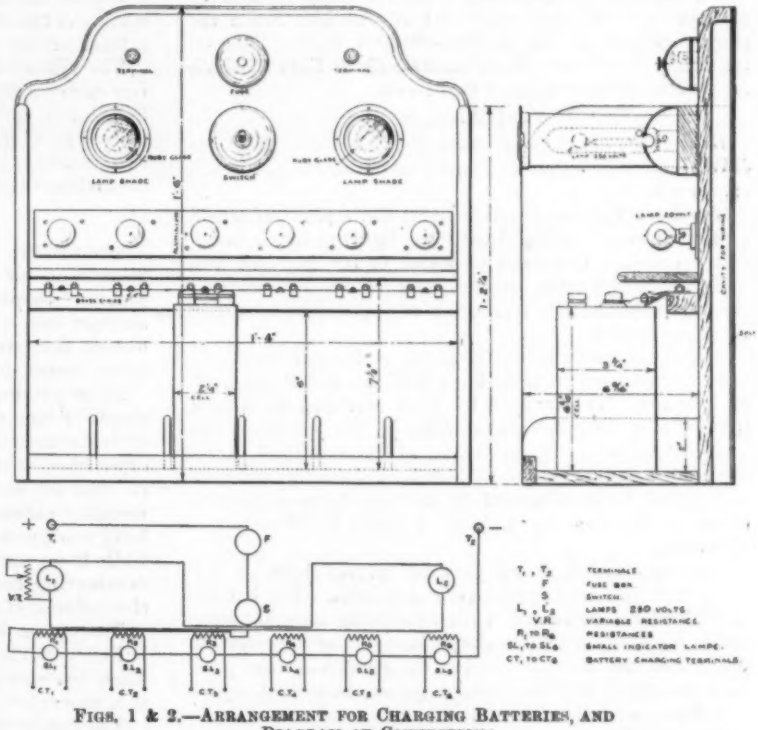
Many people have an unfounded horror of things electrical; owing to lack of instruction, or too great caution, they fight shy of any apparatus which looks electrical. I have borne this point in mind when devising a charging set which is capable of charging any number of cells up to six at one time.

Moreover, one or more cells can be taken off charge without interfering with the remainder, and it is not necessary to switch off the current for the purpose of putting on or taking off a cell, as there is no actual breaking of the circuit, and therefore no fusing of the contacts.

The potential difference between the battery-charging terminals is approximately 2·5 volts when the battery is on charge, but when the battery is taken off charge, the voltage immediately rises to 24, whereas under normal conditions the voltage across the terminals, when the battery has been taken off charge, would be equal to the voltage of the supply mains—in this particular case, 250 volts.

It is common knowledge that the gases given off the plates of accumulators when on charge, have, if combined with a certain amount of air, very explosive properties; therefore, it will be readily seen that if a cell is defective internally, that is, say, if a lug is broken away from the top of the plates, there is a tendency for high-voltage current when charging off 250-volt mains to pass across the gap at the break, and the voltage is sufficient to set up an arc of sufficient intensity to ignite the gases contained within the celluloid case. Such an explosion of the gases is, of course, ruinous to the battery. As I have mentioned before, the voltage across the battery in the arrangement I am describing cannot at any time exceed 24, therefore a break in the cell as above described will not ignite the gases contained within the cell, the voltage being insufficient to cause current to bridge the gap and set up arcing.

The sketch, fig. 1, shows a general view of the charging arrangement, which is capable of charging up six cells at a time, and fig. 2 shows the general wiring diagram. Say, for instance, that No. 4 cell is fully charged and is required, the cell is pulled forward and lifted out of the guides; the action of removing the cell shunts the main current through the 24-volt lamp immediately above the cell compartment, and it lights up, thus indicating that the cell compartment is empty.



Figs. 1 & 2.—Arrangement for Charging Batteries, and Diagram of Connections.

It will now be seen that it is impossible to put a cell on charge inaccurately, and, therefore, it is not necessary to use pole-testing paper, &c., as is customary with the ordinary type of charging apparatus. If a cell is defective (say a broken lug internally), and is put on charge, the

defect is indicated by the illumination of the 24-volt lamp according to the internal resistance of the battery set up by the fracture in the lug. For instance, if the defect sets up a resistance which raises the battery terminal voltage to 12 or 15 volts, the indicator lamp will glow a dull red, which, of course, draws the operator's attention to the matter, and the battery is put on one side for inspection.

Although there is no necessity to touch any of the live parts of the apparatus, if by chance a pair of battery terminals are bridged across by hand, the potential difference between them is so small that even the slightest shock is very unlikely. Therefore, although at first sight the apparatus appears to consume more current than the ordinary series method, there is very little in it, the actual loss being ·004 unit per charge.

The cost of charging six 2-volt, 25-ampere-hour cells from a 250-volt main is as follows :—

250 volts × 25 ampere-hours = 6,250 watt-hours, or 6·25 units, which, at 2d. per unit, = 1s. ½d., or 2d. per cell, when six are on charge at one time.

The 24-volt indicator lamps and resistance consume 2 amperes at a terminal voltage of 24, therefore their resistance is 24/2 = 12 ohms, but when the cells are on charge the 24 volts are reduced to 2·0 volts, and, therefore, the current then flowing through this circuit is 2/12 = 0·16 ampere, or 0·16 × 2 = 0·32 watt, or for a complete charge it becomes 3·8, say, 4 watt hours, or 4/1,000 × 2 = 0·008d.

The principal claim put forward for this method of charging accumulators is that it is entirely foolproof, and the cells can be charged up by an inexperienced person; there is no technical process to go through, as it is only necessary to put the cells in the compartment if they require charging, and to pull them out of the compartment when fully charged. The best method of ascertaining when the cell is fully charged is to take the density of the electrolyte with the ordinary simple bulb hydrometer.

Fully charged cells should give a reading of 1·250 specific gravity.

THE I.E.E. (SCOTTISH CENTRE) VISIT TO KINLOCHLEVEN.

[BY OUR SPECIAL REPRESENTATIVE.]

ON Thursday, June 10th, a party of members of the Institution of Electrical Engineers and their friends left Glasgow for a three days' tour in the Highlands. The excursion was the outcome of an invitation by Mr. W. Murray Morrison, general manager of the British Aluminium Co., to visit their works on Lock Leven.

The revival of interest in Scottish water power, the somewhat mysterious glamour which hangs over the processes of aluminium making, and the pleasant prospects of good company and glorious scenery all combined to lure about sixty members up into the North-West.

Going by the West Highland Railway, the journey led by mountain and loch and across the desolate Moor of Rannoch—where only startled herds of deer broke the empty solitude of the boulder-studded waste; then by tumbling rivers and fresh birchwoods to Fort William at the foot of snow-capped Ben Nevis.

FORT WILLIAM.

Here the party was marshalled by Mr. William McWhirter for a tour of inspection of the local electricity works.*

The Fort William Electric Light Co.'s plant affords a pioneer example of highland town lighting by means of water power. The head of water is 100 ft., and two Gilbert Gilkes Vortex turbines, each of 100 H.P., drive a pair of General Electric Co.'s D.C. generators at 650 revs. per minute.

The main turbines are situated at Blamafoldoch, 2¾ miles across the hills from Fort William, and the energy, at 560 volts, is conveyed by bare overhead lines to a battery and distribution station in the centre of the town. The town station has, in addition to the battery, a small emergency water turbine and a 40-H.P. Hornsby oil engine, both arranged by belt to drive a battery-charging dynamo, the output of which is 70 amps. at 450 volts.

The standard lighting pressure in the town is 150 volts, and the power pressure is 300 volts. The battery is divided in the centre, with regulating cells at either end, and is charged as a single unit. The town station plant includes a small booster for regulating the pressure of a pair of feeders which go overhead to Corpach—a distance of about four miles.

Mr. McWhirter, while not responsible for the original lay-out of the scheme, has been superintending the supply for the last 20 years. Two typical examples of trouble peculiar to highland installations have been dealt with by him. One of these was frequent interruption by static discharge from the overhead mountain lines. This was effectively stopped by the fittings of non-gap carbon arresters connected to large earth plates.

* Described in the ELECTRICAL REVIEW of March 5th, 1897.

The other annoyance was the pitting of the 25-in. steel pipe line at the turbines. The pitting was on the outer surface of the pipe, and was caused by the peaty water in which it lay. It has now been raised on piers to put it above the influence of the corrosive moisture.

The new diamond-cutting factory of Mr. Bernard Oppenheimer was also visited, this being now one of the chief power loads on the town supply. The factory is an offshoot from the larger one established at Brighton, and affords congenial work for disabled soldiers, who are pleasantly housed in the imposing hotel building adjoining. The processes of cutting, grinding, and polishing the stones were watched with interest. The mills and lathes are driven by five G.E.C. motors, having a total output of about 50 H.P.

The vibration caused by the high speed of the polishing disks, together with the need of individual lamps to light each mill, combined at first to produce a high mortality in filaments. It has been found, however, that Ediswan traction type lamps stand up to the severe conditions caused by vibration and constant handling.

KINLOCHLEVEN.

The visitors were up early on Friday morning for the 23-mile motor run to the head of Loch Leven. The journey, despite the qualms of those who occupied the seaward seats, was safely accomplished, and at eleven o'clock the party reached the strange town of Kinlochleven, which lies deep between the mountains.

After passing glens and caves, inhabited only by the ghosts of long dead clansmen, and having scanned miles of rocky coast line where not a smoke curl is visible, one experiences a shock on coming upon Kinlochleven, with its wharves and electric locomotives and its shops with wedding cakes advertised for sale. Kinlochleven is a fully equipped town with about 1,500 inhabitants, and while there are churches, schools, and a police office, the dominating feature is the power house with its impressive column of parallel pipes sloping up the hill side.

The power house is a spacious, well-lit, rectangular building having 11 large and two smaller turbine sets. Each set consists of a Pelton wheel turbine and two D.C. generators on one shaft.

The larger or main sets are used each for a battery of furnaces, and the smaller sets are for power, lighting and exciting.

Under the floor and along the length of the power house are a pair of aluminium busbars, which enable any set or group of sets to be coupled to any battery of furnaces.

The main turbines have a guaranteed efficiency of 80 per cent. each, developing 2,900 B.H.P. at a head of 900 ft. and at 300-400 revolutions per minute. They

have two water jets, and on the majority of the machines the governors are of the hydraulic type, operating gun-metal spear-head valves. Two of the sets have oil-controlled governing gear; while these are more sensitive, they are also more complicated. The users appear to favour the more robust water governors for furnace work, where very fine voltage regulation is not essential.

The main generators are shunt-wound, without interpoles, and have slot-wound drum armatures. The two generators composing a set are connected in parallel, and the maximum output of each pair is 2,200 KW. at 275 volts D.C.

Electrical regulation is provided to prevent flashing over, which might occur through differences in the currents flowing in the two armatures on one shaft. The field circuits are separate up to their rheostats, but have a common return in which is placed the cut-out. The cut-out is operated by two solenoids. One pressure solenoid breaks the field circuit when the terminal voltage rises to 350, and the current solenoid is connected across the two leads of the same polarity on one pair of dynamos. It is adjusted in relation to the voltage solenoid so that an out-of-balance current short-circuits the field through a discharge resistance.

The two smaller turbine sets are of approximately half the capacity of the main furnace sets. While they also have two D.C. generators on one shaft, these are capable of being used as independent machines, each of different output and voltage. The two larger machines on each set are shunt-wound, and are used for lighting the factories and village and for supplying auxiliary motors, each single generator having a maximum output of 550 KW. at 275 volts. The other two generators are of the compound-wound traction type, having a maximum output of 94 KW. at 550 volts. These are employed to feed the electric locomotives and the cranes on the wharves. The main generators for furnaces, the supplementary sets, and also the locomotives are of Dick-Kerr manufacture. The turbines and their governing gear are by Escher, Wyss & Cie., except the latest addition to the main sets, where the turbine is of Gilbert Gilkes's make.

View of Kinlochleven Aluminium Works.

The extraction of aluminium provides an ideal load for a hydro-electric scheme, and the load at Kinlochleven is, approximately, 20,000 KW. continuously night and day.

The visitors were impressed by the cleanliness, the simplicity, the comparative quietness, and the even temperature of the power house. A peep through a window was permitted at the electric furnaces at work. In addition to the manufacture of aluminium, the company makes its own carbon electrodes in special furnaces. The connections between generators, furnaces, &c., and the overhead pole lines in the yards are of bare aluminium.

The Future of Scottsh Water Power.

After the inspection of the power house, the British Aluminium Co. entertained the party to luncheon at the Tartan Hotel. Mr. E. E. Eccles, the assistant general manager, formally welcomed the Institution representatives, and gave them some idea of the difficulties attending so unique an enterprise as the establishment of a great industrial community in the heart of the highlands. One realised that the present satisfactory position of the company, as well as being a victory over Nature, was also somewhat of a triumph over human nature. He urged on the visitors the need for developing more and more the resources of the Scottish Highlands, and hoped that they would use their influence to conserve the power which was running to waste and so give encouragement to the Highlander to remain among his native mountains.

Mr. W. B. Hird, the chairman of the I.E.E., Scottish Section, in reply, thanked the Aluminium Company and its staff for their welcome, and pointed out that during the last session much attention had been given by the Section to the question of the development of highland water power.

The Resident Manager, Mr. R. P. Tod, furnished some interesting facts as to costs and construction of the works, and mentioned that the factory had run without stoppage for the last 10 years. He announced the arrangements which had been made for the further entertainment and instruction of the company, and, as an incitement to effort, he indicated that a prize had been provided at the dam for the persons who got there first.

The Pipe Track.

The majority of the visitors then set out upon the serious business of the day—the exploration of the pipe track, the conduit, and the reservoir—and for the first part of the ascent many made use of the old road cut through the highlands by General Wade. By means of this road they reached the lower penstock-chamber, which is placed about 1¼ miles from the power-house. The level of the spillweir at this point is 977 ft., and the water here enters six welded steel pipes each of 39 in. diameter. The pipes are anchored to the hillside by massive concrete blocks, and go down to a pair of main bus-pipes to feed the turbines. As the turbine level is 42 ft., the net static head is 935 ft. or 406 lb. per sq. in. Air and scour-valves are fitted to the pipes. Muff joints are used except at anchor blocks, where flanges are employed.

The Conduit.

To the lower penstock-chamber, from which the steel pipes slope steeply down to the power-house, the water is led in a covered concrete box conduit from the reservoir. The conduit is 3½ miles in length, and runs along the southern side of the Leven valley. The conduit slope is only 1 in 1,000. The conduit measures 8 ft. by 8 ft. inside, and normally there is 2 ft. from the surface of the water to the cover of the conduit. The sides of the conduit are reinforced with expanded metal, and the inside floor is faced with a smooth granolithic skin. Expansion joints occur at 64-foot intervals along the straight portions of the wall. These are formed with an asphalt dowel and double bitumen strips. On the cover of the conduit the bitumen joints are replaced by slabs of timber.

The party, considerably thinned out, both as a party and individually, walked along the top of the conduit to the dam, and the course lay over arched gulleys and chasms and under precipitous rocks. On the right towered the mountain side, with here and there an in-

take pipe from some upper lochan, and on the left far below was the gorge cut by the River Blackwater.

The Dam.

The first sight of the dam is impressive. The upper part of the valley is blocked off by this great wall, measuring 86 ft. high at some parts and with a straight skyline of 3,112 ft. The top of the dam is 1,068 ft. above sea level, and it holds in check a loch reservoir over seven miles long and half a mile wide. The catchment area from which the water is collected is 55 sq. miles, and the reservoir holds more than 20,000 million gallons of water. The average annual rainfall over the catchment area is about 70 in. The dam is bedded everywhere on solid rock. The top thickness is 10 ft., and the upper face is plumb for the first 40 ft., when there is a batter of 1 in 20 to the base. At the base the dam is 60 ft. from back to front at some parts. At the centre of the dam is the valve tower; the valves control three 40-in. diameter pipes. The difference between the levels of these three intake valves and the six pipe valves at the power-house is 993 ft.

Mr. Hird had the energy and the honour to arrive first at the valve tower, and there for a little time he held a reception of the wayfarers as they came straggling up to inspect the tower and its interesting contents.

It was noted that the war had made a considerable demand on the resources of the whole scheme. Advantage has been taken of the presence of a band of German prisoners to connect up Loch Eilde Mor with the reservoir. This has been done by means of concrete pipes and 4 ft. 6 in. bore which were made in Kinlochleven, and stretch for a length of some four miles along the hillside on the opposite side of the valley to that of the main conduit track.

The Finish.

On leaving the dam several took the old bridle path down by the rocky bed of the Blackwater back to the town of Kinlochleven. After dinner those who had not elected to stay the night at Kinlochleven motored back to Fort William.

Saturday forenoon was spent in visiting local beauty spots, in which this district abounds, and while some were left to climb Ben Nevis or go further afield, the tour officially ended with the departure of the noonday train for Glasgow.

The arrangements for this thoroughly enjoyable excursion were chiefly in the hands of the Scottish I.E.E. Hon. Secretary, Mr. Joseph Taylor, and those of Mr. Thomson, of the British Aluminium Co. Perfect weather and the hospitable services of the ladies and the staff at Kinlochleven did much to make the visit a delightful memory.

D. S. M.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

New Cooking Apparatus.

Among the latest products of the British Electric Transformer Co., Ltd., 50, Oxford Street, W.1, are the ovens and boiling table illustrated in fig. 1 and the plate heating cupboard shown in fig. 2. The boiling table measures 6 ft. 2 in. by 2 ft. 2 in., and has eight "hot spots"—four with 1-kw. loadings and four having 1.5-kw. loadings—each controlled by a heat regulating switch. The top and legs are of cast iron. Fig. 1 shows four ovens with hot shelves between the two sets, and at the top. The total maximum loading is 1,500 watts controlled by switches designed to put in various combinations of the heating elements. The cupboard (fig. 2) is of oak, and measures 2¼ ft. by 1½ ft. by 2 ft. 10 in. It is divided into two compartments having drop doors fitted with nickel-plated handles and tops—the latter being utilised as hot plates. The interior is lined with aluminium lagged with asbestos. The total maximum loading is 1 kw. Racks to hold 22 plates may be fitted or the cabinet may be used for keeping food warm.

House Lighting Plant.

Messrs. Mark Webber, Ltd., Church Acre Works, Guildford, have sent us particulars of an efficient and economical single cylinder petrol engine suitable for supplying lighting and power to a country house. The "Webber" engine, which is illustrated in fig. 3, possesses many good points, among which may be included the low fuel consumption which is obtained by a number of devices. The piston friction is reduced by the use of a slipper piston, and the crankshaft is mounted on ball-bearings. Forced lubrication of the big end is made by an oscillating plunger pump without the use of pipe work, the oil being delivered through the plunger itself. The camshaft and cams and bearings are contained in a trough which is filled with oil flung out from the big end, and are consequently always immersed. The overflow from this trough feeds the timing gears and governor. The use of very light reciprocating parts eliminates a great deal of vibration. The magneto is operated by a chain drive, and the chain runs in an oil bath. Cooling water is applied direct

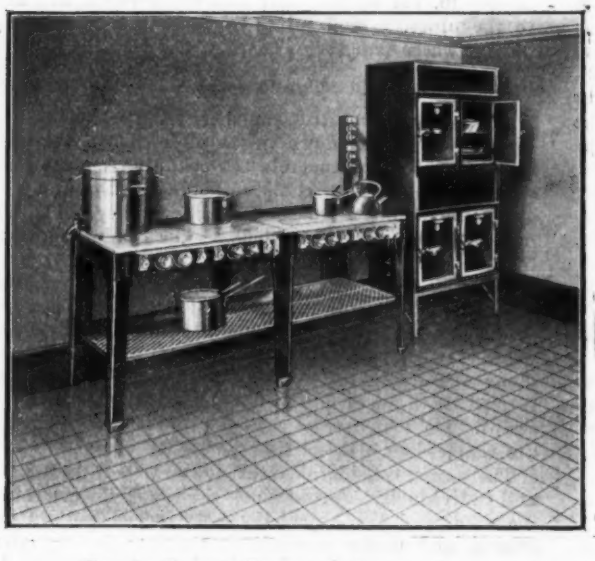


Fig. 1.—Boiling Table and Ovens.

Fig. 2.—Oak Plate-heating Cupboard.

to valve seats where it is most needed, and all working parts are easy of access. The dynamo can be coupled direct to the shaft of the engine, and fixed on the same bedplate. The fuel consumption of this engine when running on petrol is about .6 pint per B.H.P.-hour, and the lubricating oil required is

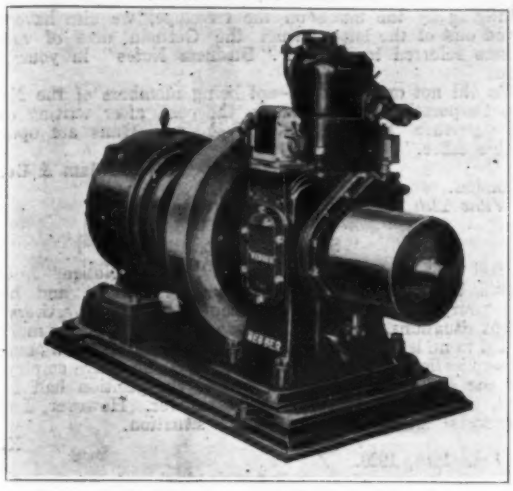


Fig. 3.—The "Webber" Engine.

.012 pint per B.H.P.-hour. The size of the lighting sets ranges from 2 to 16 B.H.P., or from 1 to 9 KW. These machines can be adapted to run on gas or paraffin by making the necessary alterations in valves and ignition.

New Wiring Devices.

Mr. H. White, A.M.I.E.E., 1, Cumberland Street, Deansgate, Manchester, has sent us details of some new wiring devices he has recently designed. One of these, a "Universal" connector box, is shown diagrammatically in fig. 5. By means of this it is possible to obtain any combination of ways for two or three or four wires while ensuring that no other openings are left in the box. The object is attained by dividing the circumference of the box into sixteen equal parts, slots being cut at 1, 3, 4, 5, 6, 7, 9, 11, 13, 14 and 16 as shown in the diagram. A tight-fitting lid has four openings at

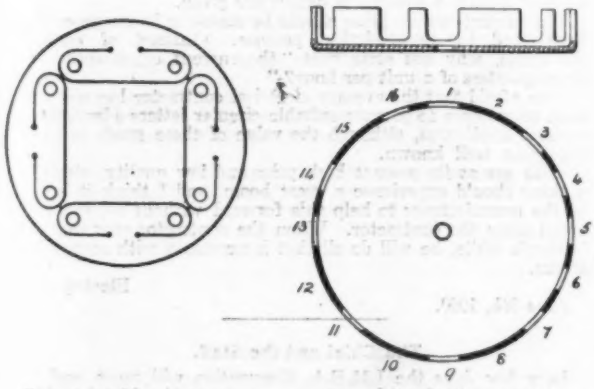


Fig. 4.—Bonding Clamp.

Fig. 5.—"Universal" Connector Box.

90 deg. By revolving the box it is then possible to obtain any combination desired (4-way, tee, straight through or right angle) only the openings to be used coinciding with the slots in the lid. Another device is shown in fig. 4. This is a circular piece of metal, fitting into the connector box, with four strips for binding over the cables, thus forming an efficient "universal" bonding clamp and ensuring electrical continuity in the sheathing of the wires.

LEGAL.

Stobie v. Newcastle-on-Tyne Electric Supply Co.

The action brought by Mr. Victor Stobie, carrying on business as the Stobie Steel Co. at Dunston-on-Tyne, in the County of Durham, against the Newcastle-on-Tyne Electric Supply Co. came before Mr. Justice Peterson in the Chancery Division upon an adjourned summons on June 8th, and was continued on subsequent days.

Mr. Tomlin, K.C., appearing for the defendant company (the Electric Supply Co.), said that the summons had been issued to determine a question that had arisen in taking an account directed by a judgment of his Lordship on April 30th last year.* The account ordered was one relating to the profits made by Mr. Stobie in his business, his Lordship having held that under certain agreements the defendants were entitled to share in those profits. The matter went before the Master in Chambers, when Mr. Stobie produced two balance sheets of profit and loss. A question then arose which the Master was not in a position to determine, in consequence of which this summons was issued. It asked for a declaration that new works established by the plaintiff adjacent to the works at Dunston-on-Tyne formed part of the assets of the Stobie Steel Co., and were not the property to which the plaintiff was beneficially entitled, and that the business carried on by the plaintiff at the new works under the title of the Stobie Construction Co. formed part of the business of the Stobie Steel Co. and that accounts be ordered upon the footing of such declaration. Counsel contended that defendants were entitled to a share in the profits of the Stobie Steel Co. under agreements which he read, and said that since his Lordship's judgment Mr. Stobie had adopted the name of Stobie Construction Co. in relation to the new works with a view to excluding the Newcastle Electric Supply Co. from their share of the profits from this undertaking. It appeared that in June 1917, there were for sale certain works adjoining the works of the Stobie Steel Works at Dunston. These were known as the Bradley Williams Works, which were used for the treatment of ore. Mr. Stobie went to the committee with a proposal that these works, which were then in the market, should be purchased. The committee asked Mr. Stobie to get out an estimate for purchasing and equipping them. What Mr. Stobie proposed was to set up there an electric furnace plant for the manufacture of white pig iron. At the next meeting of the committee on June 20th Mr. Stobie reported that he had bought the Bradley Williams Works for £2,000, and that he proposed to install a furnace for the manufacture of pig iron and after the war to install cogging or rolling plant. Cogging or rolling plant was acquired for converting steel ingots into billets. The Stobie Steel Co. had not at the time on their works any cogging and rolling plant, and they sold their steel in ingots or got it converted into billets by outside firms. The installation of a cogging and rolling plant would therefore be of great service to the Stobie Steel Co. Mr. Stobie's estimate of equipping the Bradley Williams Works with the necessary machinery was £3,000, and the committee agreed that the matter should go forward on these lines.

Mr. Upjohn, K.C., counsel for the plaintiff, said that the functions of the committee had come to an end at this time, and they had no power to authorise anything.

Mr. Tomlin said that whether there was a formal authorisation by the committee or whether the committee had any express power to authorise or not there was no doubt that what Mr. Stobie contemplated was submitted by him to the committee for approval. He further contended that the business established at the Bradley Williams Works was part of the Stobie Steel Works, and was administered by one staff, the employés being paid by one official.

The hearing was adjourned.

On resuming on June 9th, Mr. Tomlin continued his opening for the Electric Supply Co., referring to numerous books, documents and accounts in proof of the business relationship between the parties.

Mr. Upjohn contended that the two businesses were distinct, and read an affidavit of Mr. Victor Stobie which stated that from 1906 thenceforward he carried on at Sheffield the business of designing and building works and plant such as steel-smelting furnaces and colliery plant manufactured in accordance with several inventions made by him and protected by letters patent. He was also a consultant in metallurgy, and such business he referred to as his construction business. This included the purchase of steel plates and other sections of constructional steel and the cutting, proving and riveting together of such steel to form furnace and other works plant, purchasing motors, transformers and other electrical apparatus. The business carried on under the style of the Stobie Steel Co. mentioned in the agreements in this case was a business entirely different and distinct from his construction business. It consisted of the purchase of steel scrap and ferro-alloys and the melting by means of electricity of such scrap and alloys into a liquid form in a chemically controlled bath and the casting of the liquid steel into the form of ingots to be sold to manufacturers. It did not comprise any constructional work. It was not true that his constructional business was in any way a part or an extension of that carried on under the name of the Stobie Steel Co. It had become

* Electrical Review, May 9th, 1919.

very difficult in consequence of the war to get regular supplies of scrap steel, ferro-alloys and other materials for the steel works, and it was necessary to acquire and store a large amount of them. There was not sufficient space at the steel works to store this material, and before he was able to restore his construction business be permitted, as a temporary expedient, the storage of scrap steel in considerable quantities at the new works. In 1918 he commenced to fit up the new works with plant and with his own Stobie electric furnaces. The business carried on there occupied exclusively about three-quarters of the works, and he carried on the construction business there under the style of the Stobie Metallurgic Construction Co. For the purpose of his construction business he had taken over from the steel works goods at the price at which they were sold in the ordinary course of business, the cost of such goods being debited and credited in the books of the two companies. That had also been done when men had been engaged in either business while in the employ of the other. There had been no community of business as between the steel works and the Bradley Williams Works.

Mr. R. P. SLOAN, director and manager of the defendant company, gave evidence in support of the defendant's case to the effect that there was ample room on the site of the Stobie Steel Works to store the scrap metal required, and said that to the best of his recollection the Control Committee of the Stobie Steel Co. approved of the purchase of the new works, the object of which was to extend the steel works.

The hearing was continued on June 10th, when further evidence was given to prove that the new works were carried out for the Stobie Steel Co., who had been debited with the charges for materials and labour.

The evidence of other witnesses was taken on June 11th, when the hearing was adjourned until June 16th.

(To be continued.)

MORROW *v.* STEPNEY CORPORATION.

IN the Chancery Division, on June 9th and 10th, Mr. Justice P. O. Lawrence was engaged in hearing an action against the Stepney Corporation to restrain them from causing a nuisance by smoke, &c., from their electric power station at Limehouse.

Mr. Owen Thompson, K.C., and Mr. R. S. Northcote were counsel for the plaintiff, and Mr. Jenkins, K.C., with Mr. J. E. Harman, appeared for the defendants.

The plaintiff carried on the business of a mast, oar, and scull maker in Brightlingsea Place, Limehouse. His premises consisted of a workshop, a dwelling house, and a timber yard, which were opposite to the defendants' power station. His allegation was that the grit and ashes from the works caused him and his family great discomfort, and created an intolerable nuisance, and he asked for an injunction to restrain the Corporation from continuing to discharge grit and ashes from the chimney stack of the works. At the defendants' works there were 13 boilers, nine of which were generally in use, and eight or nine chimney shafts about 80 ft. in height. They consumed about 40,000 tons of coal a year, and they supplied about two square miles with electricity, and had some 3,800 customers for electric light or power.

Mr. Justice P. O. LAWRENCE, after hearing evidence and the arguments of counsel, in giving judgment, said that, in his opinion, the plaintiff and his witnesses had given their evidence very fairly and without exaggeration, and he (plaintiff) had proved to his satisfaction that the effect of the grit and ashes from the defendants' chimneys deposited upon his premises was to block the gutters and stack pipes on his workshop and to cause the premises to be flooded when it rained. Further, the gritty deposits penetrated the cracks in the timber in his yard with the result that when he worked at the timber the edges of his tools were blunted. Plaintiff also showed that his dwelling house was rendered so uncomfortable by the gritty dust and ashes which fell on the beds and clothing that he was justified in moving to another house. The evidence, said his Lordship, proved conclusively the extent of the deposit, and it satisfied him beyond doubt that the discharge from the chimneys of the defendants' works had rendered the plaintiff's premises less suitable for business and residence. The defendants said that there had been delay in bringing the action. In one sense there had been some delay, but it was to the credit of the plaintiff that he had not taken steps to stop the nuisance until it became intolerable. No exceptional circumstances had been proved by the defendants to induce the Court to exercise its judicial discretion to award damages in lieu of an injunction. The plaintiff was therefore entitled to an injunction which would be suspended for a short period to give the defendants time to abate the nuisance. No special damages had been proved, but he thought he was justified in granting plaintiff £50 as general damages for the discomfort which he had suffered, with the costs of the action.

It was subsequently arranged that the injunction should be suspended until November 12th next.

BUENOS AIRES PORT AND CITY TRAMWAYS.

In the Chancery Division, on Monday, Mr. Justice Eve sanctioned a scheme for the reorganisation of this company and an agreement giving effect thereto.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

German Representation.

Judging by the name on the envelope, we also have received one of the letters from the German firm of meter makers referred to in your "Business Notes" in your last issue.

We did not open it, but—not being members of the Newport Corporation—replaced it in the post, after writing over our signature "No letters received from Huns are opened in this office."

E. P. Allam & Co.

London.
June 12th, 1920.

"Situations Vacant."

I feel very grateful to you for the "Special Notice" in this week's ELECTRICAL REVIEW re situations vacant, and hope that your kind offer will be accepted by all advertisers of vacant situations. Personally, I have during the last six months replied to no less than 50 advertisements in the REVIEW; one of the applications resulted in an interview, about five employers had the courtesy to inform me that the position had been filled, the rest made no response whatever. However, I still hope to be successful in obtaining a situation.

X.

June 12th, 1920.

We are very interested in your "Appointments Filled" column, which we think is a step in the right direction; but we have a better suggestion to make to solve the difficulty, and that is to recommend that everyone applying for a job should religiously eschew answering advertisements under box numbers; it is little short of an anonymous letter. The writer's policy with letters of that sort is to put them in the waste-paper basket, and he would treat advertisements under box numbers in the same way. Surely we are British enough to be able to trust each other when a berth is advertised, and when an honourable application is made for the same.

For the **Walsall Electrical Co., Ltd.,**
J. DELEBECQUE, *Works Manager.*

Walsall,
June 12th, 1920.

"What is the Contractor Doing?"

Some of the remarks made by your contributor in your issue of June 4th are quite correct, in my opinion. The electrical contractor certainly *does* need to wake up; at the same time the electrical manufacturer has not done all that he could. For instance, take the leading electrical manufacturers' lists of cooking and heating appliances, and you will find in most instances that:—

1. The actual current consumption of the apparatus is carefully left out.
2. There are no details as to the length of time necessary to do the work required.

If these details are not given in the makers' catalogues, they should be prepared to supply the contractor with suitable circular letters in which full details *are* given.

The current consumption should be stated in language easily understood by non-technical persons. Instead of saying 750 watts, why not state that "the current consumption is three-quarters of a unit per hour?"

I am afraid that the average electrical contractor has not the time or patience to prepare suitable circular letters advertising cooking appliances, although the value of these goods is now becoming well known.

With gas at its present high price and low quality, electric cooking should experience a great boom, and I think it is up to the manufacturer to help this forward without relying too much upon the contractor. When the contractor sees that it is worth while, he will do all that is necessary with regard to stocks.

Electra.

June 8th, 1920.

The Chief and the Staff.

In a few days the I.M.E.A. Convention will meet, and it would be well that the members present should take this particular gathering very seriously, for it is certain that there will be much talk and more thought over that very ominous word "Schedule." First, engineers as agents of employers should remember that employés lose public sympathy when *they* fail to stand by any agreement between masters and men! very well, so also will the *employers* lose public sympathy when they fail to carry out a joint agreement between masters and men. Secondly, engineers never have appreciated their own value because they have been too selfish, and in years gone by, having got on a little way themselves, refused to allow their unfortunate juniors to do likewise; they

neither valued their own brains nor other men's, until now engineers' brains are counted of no value at all in the commercial world. It is perfectly true that you cannot damn another's career without doing damage to your own; nor can one keep a slave without becoming a slave also. Chief engineers are in lots of cases finding this out. Their status is low, wholly because they set out with the object of making their subordinates' status low. The engineer has been a fool, and instead of the elder brother helping the younger, he has trodden on him; now the worm has turned, and the tragedy is that the reformation of status and conditions of labour has come from the lowest rung of the ladder, instead of coming down from the top, as it ought to have done. Now, of course, unless the engineers are still fools they will press the claims of the junior and thus their own status will improve, if they have the influence that is claimed, and all without any effort on their part. If not, then they will have a taste of their own medicine, that is, receive little more than their assistants, as they made their assistants receive little more and often less than the labourers. I should suggest that engineer members talk the matter over very seriously before any such expression as "ridiculous" is used with reference to the schedule of the National Joint Board; pre-war values were neither right nor reasonable. This schedule represents only a small per cent. advance on the real pre-war value, the just value of a man's brain and knowledge. To say that it was then a case of "supply and demand" justifies any extreme demand that employés may now make. Employers made a moral principle which it is not logical for them to alter and whine over because it is against them now. It is a law of nature that if you injure others you injure yourself, and all the talk in the world will not make right for one wrong for the other. If an undertaking cannot stand the charges and make a profit, then the charges must be raised until they do; I have yet to hear of the chief engineer who considered the profits of his undertaking when urging his own claims. There is no justification for a commercial undertaking to pay top price for manual labour and squeeze the technical man on such a plea. The engineer has been cheap, and now is an opportune time if only all will pull together to make the non-technical man understand that the electrical supply engineers consider themselves of some value which has to be paid for; but if we have amongst us at the top men who have no use for any other pronoun besides "I," then harm must be done. At present the technical worker is not prepared to throw in his lot completely with the manual worker, though there is a struggle at present to induce him to do so. I only hope that it will not prove that any member of the I.M.E.A. has it in his mind to be one of the means to bring this about at once, or he may live to reap the bitter fruit of his thoughts. We are all members of one grand profession; some day others will follow you. It depends on you *now* whether you will be honoured as a credit to a noble calling or despised as a hindrance to the attainment of its proper dignity.

A Technical Worker.

June 8th, 1920.

Non-Union Labour and Supply Undertakings.

At a meeting of District Council, Area No. 10 (Greater London), for the electricity supply industry, the question of connecting-up jobs or work done by non-union labour to the supply undertakings mains was discussed at very great length. No agreement was reached on the matter, but the following resolution was passed unanimously by the employés' side:—

"That the trade unions' side of District Council for Area No. 10, for the electricity supply industry, decide that on and after July 1st, instructions will be issued to their members that they are not to connect up any jobs or work done by non-union labour or scab labour in the area covered by this District Council."

In addition, the consent of the various executives of the unions concerned has been asked for, for permission to cease work on July 1st against any or all non-union labour employed in all or every electricity undertaking in the area covered by District Council No. 10.

W. J. Webb,
London District Secretary of the E.T.U. and Secretary for the employés' side of District Council, Area No. 10, for the Electricity Supply Industry.

London.
June 14th, 1920.

Fault Localisation.

Having read with great interest the article in the Review of May 28th on "Cable Fault Localisation," by Mr. Raymond-Barker, also "Kon Denser's" letter in the issue of May 7th, it might interest your correspondents to know that the writer had a similar experience some years ago.

A high-tension, 3-phase, 3-core cable about two miles in length developed an open circuit on one line. Tests for insulation resistance between conductors and also between each line and earth gave no clue, so the writer suggested a capacity test.

A tangent galvanometer was used, and the cable charged from a 500-volt circuit, each line separately. The conductors were discharged through the galvanometer, and deflections of the needle were noted. The faulty line gave half the deflection given by each good line, both of which gave equal throws. The test was then repeated under identical conditions but from the other end of the cable, with the same result as before. Since the cable was uniform throughout its length and the lead sheath continuous and efficiently earthed, it was assumed that the galvanometer deflections would be proportional to the length of the cable. The nearest joint-box to the middle of the cable length was broken down, and it was found that one line had open-circuited at the sleeve joint in this box and the other two were almost separated but still making metallic contact with the other half of the cable. In this case the faulty line was well insulated at the break, the compound having sealed the ends.

J. W. H.

June 7th, 1920.

Composition v. Porcelain Insulators.

In your issue of June 4th, Mr. Geo. V. Twiss, M.I.E.E., writes to find fault with a brochure we have recently issued dealing with "Telenduron" insulators.

Perhaps we have failed to make sufficiently clear that "Telenduron" is manufactured to different specifications to suit the special requirements of different articles. For "Telenduron" as used for telegraph and telephone insulators supplied by us to the G.P.O., we claim:—

1. That it is less brittle than porcelain.
2. That while ordinary commercial porcelain to some extent depends upon its glaze for its insulation, in the case of "Telenduron" the surface finish is of no importance.
3. That its electrical properties as substantiated by N.P.L. reports are ample for all ordinary low-voltage requirements.

For high-voltage transmission we manufacture "Telenduron" to other specifications to suit the special requirements of the consulting electrical engineer.

"Telenduron" is more durable than porcelain. While, like porcelain, it does not incorporate vegetable and animal substances, but is made from "rocks of the earth itself"—to quote Mr. Twiss—it also stands knocking about—which porcelain does not.

per pro **Thomas De La Rue & Co., Ltd.,**
H. C. Parker, A.M.I.E.E.,
Manager.

Walthamstow,
June 15th, 1920.

Composition v. Porcelain Insulators.—Correction.—A serious printer's error occurred in the schedule given in the letter of Mr. G. V. Twiss on this subject, in our issue of June 4th. The Schedule should read:—

	Telenduron.	Porcelain.
Flash-over voltage, dry...	40 K.V.	40 K.V.
Puncture voltage ...	25 K.V.	At least 75 K.V.
Absorption	·1 to ·3%	Immeasurably small. Certainly below ·01%

Recent Magneto Improvements.—Recent improvements in magneto design have much reduced the minimum speed at which the magneto will produce regularly sparks of some given intensity. A certain four-cylinder magneto, for example, will spark regularly across a 5.5 mm. three-point gap at about 60 R.P.M. with the timing lever fully advanced. This type of machine has been found to give good starting on a 3-ton lorry engine, which was always difficult to start with the much larger type of magneto (of older pattern) that it displaced.

This, however, according to Messrs. A. P. Young and H. Warren, *Procs. Inst. of Automobile Engineers*, is not enough; and as an alternative to the complicated and costly electric starter, what is called by Americans an "impulse starter," opens up large possibilities. This device is designed to take the place of the ordinary coupling. It comprises, in essence, two members, one of which is rigidly secured to the magneto-spindle and linked to the other, which is attached to the driving spindle by a stout helical spring. When the crankshaft is slowly rotated the two members will move together until a pawl carried by the member on the magneto spindle is held by a stop fixed to the frame of the magneto. Any further motion of the member on the driving spindle causes the spring to be wound up, during which time the armature remains stationary. After a definite movement of this member the pawl is released, and the armature then suddenly flicks over, producing during its rapid motion an intense spark. This is sufficient to start the engine, which rapidly accelerates. At a very low speed, the pawl is thrown out of action by centrifugal force, and the two members rotate as a single unit. As compared with an electric starting system, this device is naturally much cheaper, and, being a compact and single mechanical unit, it obviously has—other things being equal—enormous advantages from the standpoint of reliability.—*Technical Review.*

BUSINESS NOTES.

Notice to Readers.—As several correspondents have placed before us particulars of certain business transactions of a disappointing and unsatisfactory character relating to purchases of conduit, it is thought that there may be others who have been similarly inconvenienced. If so, will they communicate with the Editors of the ELECTRICAL REVIEW, 4, Ludgate Hill, E.C. 4.

Siemens Sports' Club.—The directors of Siemens Bros. and Co., Ltd., have presented to the Siemens's Sports Club, formed by the employés of the company at its Woolwich works, a football challenge shield for competition between the various departments. The presentation, which took place on May 28th, was made by two of the directors—the Rt. Hon. Sir William Bull, M.P., and Mr. G. Chauvin, managing director—who at the same time handed over a room for the accommodation of the club until such time as a suitable sports ground can be found. Sir William Bull congratulated the club upon its success in having over 1,300 members already enrolled. The first winner was the Apparatus Machine Shop, which thus heads the list of names to be engraved upon the shield.

The shield, which was designed and made at the Woolwich Works, possesses many unique and emblematic features. It is constructed in fine figured oak, upon which, carved in bas relief, are shown some of the products of the company, viz., overhead telegraph and power lines, an automatic telephone instrument, a searchlight projector and primary cells. The carving also includes a representation of the company's cableship *Faraday*, and of a deep sea grapnel, used for picking up submarine cable at great depths. Above the shield proper is a full size football in wrought copper, beneath which appears the Arms of the Borough of Woolwich. The shield is six feet in height, and is arranged for suspension by means of a suitable length of an actual cable which played no inconsiderable part in the successful defeat of the submarine menace in the late war, and which was manufactured at the Woolwich works.

Lead.—In their report dated June 12th, Messrs. James Forster & Co. give the following information :—

BOARD OF TRADE RETURNS.

	Tons.
The imports for June are given as	14,568
The exports for June are given as	3,317
Left for home absorption	11,251

The latter figure for the seven months November-May (inclusive) is 29,954 tons; against this we venture to give the following figures as a conservative estimate of consumption in the three principal trades, viz :—

	Pre-war. Tons.	This year. Tons.
White lead, red lead, &c.	60,000 ...	35,000
Electric cables and accumulators ...	60,000 ...	60,000
Sheet and pipe lead, &c.	— ...	50,000
		145,000

We have the white lead and sheet lead estimates from authorities in the trade. The second (electrical) is based on the fact that the cable companies report a record trade both in values and quantity.

On these figures (which we are certain are lower than the actual) we have a total consumption of 145,000 tons for the year, against imports available for seven months of 29,954 tons. So far the metal available in the ordinary way for the requirements of consumers has been supplemented by Government war stocks, and in some localities by supplies obtained from the dismantling of chemical plant erected by the Government for war purposes. These adventitious aids have so far tided over a difficult time, but we have to rely on imports, and if our figures for consumption could be cut down by one-half we should still be left with a considerable deficit, unless the coming months show a much larger increase in imports.

Manufacture of Meters in Australia.—According to Press reports just to hand, it was expected that early in July the Small Arms Factory, Lithgow, would commence the manufacture of all kinds of meters, for gas, water, and electricity. "At present there is no firm undertaking this work to any extent in Australia, and the only meters imported are Japanese, which are said to be very inferior in quality. Extreme difficulty is experienced by companies in securing supplies, and the factory management has already received an order from a Sydney firm for 3,000 meters."

Electrical Manufacturing Developments in Australia.—For manufacturing in Melbourne, Berry's Electrical "Magicoal" Fires (Australia), Ltd., has been registered, with authorised capital of £30,000, in 60,000 shares of £1 each. Messrs. H. H. Berry, G. C. Allan, W. Lowe, G. E. Dickenson, and S. G. Pirani constitute the first board. The office of the company is at 60, Queen Street.

Confirmation of the appointment of Mr. G. Weymouth, of G. Weymouth Proprietary, Ltd., Melbourne, and Messrs. J. B. Nicholson and A. A. Stewart as joint managing directors for five years of the English Electric Supply Co. of Australia, Ltd., was to be asked of shareholders in Standard Waygood Hercules, Ltd., Sydney, at a meeting on May 6th. G. Weymouth & Co., Pty., Ltd., lately acquired a large interest in Standard Waygood Hercules Co., Ltd., and the name of the latter is to be changed to English Electric Supply Co. of Australia, Ltd. The Standard Co. has issued its report for the year ended March 31st last, showing a net profit of £46,237, which compares with £16,993 for the previous year. It is proposed to pay a dividend of 10 per cent. per annum and a bonus of 2s. per share. Failing instructions to the contrary, the bonus will be applied towards paying up a new issue of 21,600 shares offered to present shareholders. The Brisbane business has been closed. An outlay of £150,000 is anticipated for extension of works, at which to carry on manufacturing in Australia for the English Electric Supply Co., Ltd.—*Sydney Sun*, April 22nd.

Applications for British Trade Marks.—Appended is a summary of the recent applications for British trade-marks in respect of goods associated with the electrical trades and industries :—

Karmak. No. 400,550. Class 13. Sparking plugs, electrical fittings, &c. Bernard A. Quick, 20, Gladstone Park Gardens, and Arthur R. Kearney, 6, Templars Avenue, Golders Green, London, N. February 9th, 1920.

Instanto. No. 401,272. Class 13. Sparking plugs. Sydney E. Taylor, Frederick O. Ellis, and George E. T. Archer, 307, London Road, Southend-on-Sea. February 27th, 1920.

B.M.T. British Motor Trading Corporation, Ltd. (lettering combined with wheel design). Electrical insulating materials, &c. British Motor Trading Corporation, Ltd., 20-22, King Street, St. James, London, S.W. May 26th, 1919.

Platomac. No. 402,366. Class 13. Sparking plugs. Pickhard, Dobson & Co., Ltd., 536, Claremont Road, Rusholme, Manchester. March 26th, 1920.

Thomson Electric Welding (lettering, combined with design). No. 391,280. Class 18. Electric plant for welding, forging, brazing, and soldering. Thomson Electric Welding Co., 84, State Street, Boston, U.S.A. May 95th, 1919.

Resilia. No. 400,077. Class 8. Electrical measuring instruments. Chas. E. Foster, trading as the Foster Instrument Co., Pixmore Avenue, Letchworth. February 27th, 1920.

New Lamps for Old. The Aladdin Renew Electric Lamp Corporation, Ltd. (lettering combined with design). No. 396,413. Class 13. Incandescent electric lamps (ordinary). The Aladdin Renew Electric Lamp Corporation, Ltd., Grosvenor Mansions, 82, Victoria Street, Westminster, S.W. October 23rd, 1919.

Kayb. No. 399,422. Class 13. Sparking plugs. Thos. Kay, trading as A. Kay & Co., Bolton Brass Works, Blackhorse Street, Bolton.

Reflex. No. 403,686. Class 13. Sparking plugs. The Reflex Ignition Co., 3068 West 106th Street, Cleveland, O., U.S.A. May 3rd, 1920.

Nonsol. No. 401,621. Class 40. Insulating tape principally composed of india-rubber. Connolly Bros. Adhesive Tapes and Insulating Materials Co., 69, St. Stephen Street, Salford, Manchester. March 9th, 1920.

Electrical Installations for Ontario.—H.M. Trade Commissioner at Toronto (Mr. F. W. Field) has informed the Department of Overseas Trade that the Hydroelectric Power Commission of Ontario has issued a notice to electrical manufacturers, jobbers, and dealers in Ontario to the effect that all electrical material, devices, and fittings for use on inside electrical installations in the Province of Ontario, must not be offered for sale until their design and construction has been approved by the Hydroelectric Power Commission of Ontario. (6 Geo. V, Chapter 19, 1916.) Manufacturers whose products are approved and listed by other recognised authorities, and which also meet the requirements of this Commission, may have same placed on the approval list by making application in accordance with Approval Laboratories' Bulletin No. 5, copies of which are on file with the Department of Overseas Trade.—*Board of Trade Journal.*

German Debts : Warning. — The Controller of the Clearing Office (Enemy Debts) desires to warn the public that attempts are being made by German agents or principals to obtain direct settlement or payment of their pre-war debts from their British debtors. By the terms of the Treaty of Peace Order, 1919, it is unlawful for any person to pay or to accept payment of a debt coming within the provisions of Article 296 of the Treaty of Versailles, and communication between the parties interested as debtor or creditor is forbidden. Any person contravening this provision is liable to be proceeded against and punished as if he had been guilty of the offence of trading with the enemy. Severe penalties are similarly imposed by German law on German nationals contravening this provision of the Treaty. Persons or firms to whom overtures have been, or may be, made for settlement of pre-war debts, except through the Clearing Office, are requested to immediately communicate full particulars to the Secretary of the Clearing Office (Enemy Debts), Cornwall House, Stamford Street, London, S.E.1. British nationals who are creditors of German nationals in respect of pre-war debts, and who have not yet notified their claims to the Clearing Office, should do so at once, in view of the fact that the time limit fixed by the Treaty for notification expires on July 10th, 1920. British nationals, to whom official applications have been sent by the Clearing Office for payment of all debts whether above or below £50 admitted to be due to German nationals, should pay these debts forthwith: failure to do so increases the interest chargeable against the debtor and exposes him to the risk of payments of law costs. British claims to the number of 34,802 were on the 15th ultimo notified to the German Clearing Office, and a further large number will be notified during the present month. As soon as the notification of the admission of these claims has been received from the German Clearing Office payment will be made by the Controller without further request by the British creditor.

Capital of Italian Electrical Companies.—The *Economic Review* reproduces from *L'Economista d'Italia* of May 23rd, the following table showing the amount of capital invested in electrical companies up to October 31st, 1919, according to statistics published by the Electrical Engineers' Association :—

	No. of companies	Capital in L.1,000
Piedmont	31	122,394.5
Lombardy	94	536,811.9
Venetia	24	120,268.0
Liguria	17	168,830.0
Emilia	8	26.7
Tuscany	22	132,494.7
The Marches	12	12,505.0
Umbria	3	1.9
Abruzzi and Molise	8	2,297.0
Campania	30	183,260.05
Puglia	12	8,454.0
Calabria	11	6,266.0
Sardinia	1	120.0
Sicily	9	18,430.7

Rubber-covered Wire: Conditions of Importation into Australia.—Rubber-covered wire imported into Australia must comply with the conditions set out in a proclamation issued in the Commonwealth on April 2nd, 1919. This proclamation, originally notified to operate from July 1st, 1919, was not actually enforced until April 1st, 1920.

We regret that we have not space to spare to print the full proclamation setting forth in detail the conditions and tests that have to be complied with, but these particulars can be obtained by those interested from the office of the official secretary, Australian Commonwealth Offices, Australia House, London, W.C. 2.

Since the issue of the proclamation the Commonwealth authorities have decided to accept compliance with the undermentioned conditions as a satisfactory alternative to compliance with the corresponding conditions specified in the proclamation, viz. :—

1. The insertion of a tape marked as required between the vulcanised tape and outer covering will be accepted in lieu of marking on the tape.

2. The requirements laid down in the British Engineering Standards Association, Report No. 7 of 1919, revised July, 1919, will be accepted for the respective grades of cable.

It is understood that rubber-covered wire purchased from the Disposal Board is being exported to Australia not marked as required by the proclamation. The High Commissioner for Australia has been asked by the Commonwealth Department of Trade and Customs to give publicity to the fact that it is not proposed to exempt such wire from the requirements in question.

Large British Water Turbines for Cauvery River Scheme.—The order has just been placed with Messrs. Boving & Co., Ltd., for four 5,600-H.P. turbines by the Mysore Government for the Cauvery river scheme. It is believed that these will be the largest Francis turbines ever built in this country, though Pelton wheels up to 8,000 H.P. have been built here, five of this size being supplied by Messrs. Boving & Co., Ltd., to the Tasmanian Government. The turbines now ordered by the Government of Mysore will be of the single discharge spiral type for a head of 415 ft., and will run at 500 R.P.M. In addition two Pelton wheels of 450 H.P. are required for driving the exciters. These new units form the first group of the large machines which are to replace the smaller machines now installed, in order to better utilise the power available.

Electrical and Engineering Wage Demands.—The *Manchester Daily Dispatch* states that a ballot is being taken among the 55,000 members of the Electrical Trades Union throughout the United Kingdom to decide whether, if necessary, they shall cease work in order to enforce a demand for a flat rate of half-a-crown an hour. The date for the return of the ballot papers has not yet been fixed, but it is anticipated that there will be a big majority in favour of steps being taken to secure the rate mentioned. Half-a-crown per hour, it is said, would mean an increase of 7d. for the men in the Manchester area, 3d. for those in London, a little over 4d. for those in Liverpool, and as much as 8d. for workers in Scotland and other parts. It is stated that before any notices are handed in the Union will make an offer to negotiate with the Electrical Trades Federation, the employers' body concerned.

The *Birmingham Post* reports that at a private meeting at Edinburgh of employers in the engineering trades the position brought about by the latest demands of the men for increased wages was considered, and it was decided to resist those demands. The men put their claims forward in the form of an ultimatum, giving the employers three weeks to decide. The employers' meeting was private, but it was decided that not another penny should be conceded to the men. The industry is now strained to the utmost to meet the concessions already granted, and when the three weeks have expired the men must either withdraw their demand or all engineering works will be closed down and hundreds of thousands of workers locked out. At the meeting practically every firm of consequence was represented.

State Industries in Germany.—The Exchange Telegraph correspondent at Berlin states that although the German Government has abandoned plans to nationalise whole branches of industry, and has substituted compulsory trusts, the State has of late taken into its hands a considerable number of important producing concerns. From the General Electricity Co. the State has purchased power works near Bitterfeld with a capacity of 100,000 KW., which supplies Berlin City. The State has taken over the brown coal mines in Niederlausitz, and is running the electrically-driven Lauta aluminium works, which also produce artificial nitre. A large number of other power stations have been taken over under the Electricity Law of 1919. The State is also largely engaged in nitre production by the Haber and Frank-Caro processes, and has control of almost the whole aluminium production, which is mainly an outcome of the Government's investment of 300,000,000 marks in 1915. The State has also taken over the important Ilseder smelting works in Hanover.

Wages in German Industries.—The *Wirtschaftliche Rundschau* (May 13th) has an article showing the extraordinary increase in wages in the various German industries in the past few years, from which it appears that the very high wages earned by individual categories during the war became general after the revolution. The result is that Germany's economic life is seriously imperilled, as may be gathered from the following statistics :—

In the Rhine Province and Westphalia the ratio of wages to every ton of crude steel produced rose from Mk. 16, at the beginning of 1914, to Mk. 208 in December, 1919, making a twelfold increase in wages alone. The wage advances in the war industries between July, 1914, and July, 1918, varied from 300 to 400 per cent. The wages of individual categories of workers reached a fabulous height. Apart from cases—by no means rare—in which, for example, a Berlin highly-skilled worker earned Mk. 980, in a 52-hour week, wages of Mk. 200 per week were not unusual; a skilled tinsmith earning less than Mk. 100 per week would have been looked for in vain in Berlin. In addition to the wages, war allowances and other benefits were received by the workers, which cost the undertakings considerable sums of money. After the revolution, the wave of wage-increases rose to an absolutely unprecedented height. According to the *Reichsarbeitsblatt*, the average daily wage of an industrial worker (juveniles included) rose from Mk. 5.18 in March, 1914, to Mk. 13.52 in March, 1919; that of a woman worker from Mk. 2.28 to Mk. 6, *i.e.*, an advance of 261.0 per cent. for the former, and of 263.2 per cent. for the latter.

The increase in the metal-working, engineering, and electrical industries is shown in the following table :—

	Average daily earnings in marks.						
	Mar. 1914.	Mar. 1915.	Mar. 1916.	Mar. 1917.	Mar. 1918.	Mar. 1919.	Inc. p.c.
(*a*) for male workers.							
Metal-working ...	5.54	6.29	7.46	9.88	12.61	14.13	155.1
Engineering ...	5.37	6.39	7.33	8.95	12.10	14.79	175.4
Electrical Industry	4.52	4.99	5.76	9.25	12.06	13.13	190.5
(*b*) for female workers.							
Metal-working ...	2.04	2.22	3.46	4.68	5.88	5.69	178.6
Engineering ...	2.28	2.80	3.65	4.34	5.65	6.31	176.8
Electrical Industry	2.75	3.01	3.91	5.24	6.58	7.96	189.5

—*Economic Review.*

Company Liquidations.—SURREY ELECTRICAL CO., LTD. Winding up voluntarily. Liquidator, Mr. E. W. E. Blandford, 227-8, Gresham House, Old Broad Street, E.C. 2.

KINETIC CO., LTD—A meeting of the creditors was called for June 16th, at 43, Gallowgate, Leicester, on June 16th. Liquidator, Mr. T. Rimington.

TORQUAY TRAMWAYS CONSTRUCTION SYNDICATE, LTD. — A meeting of members is called for July 12th, at 62 and 68, Queen Street, E.C., to hear an account of the winding up from the liquidator.

ALEXANDER DUCKHAM & CO, LTD.—Meeting called for July 19th, at 4, Broad Street Place, E.C., to hear an account of the winding-up from the liquidator, Mr. L. A. Anderson.

W. A. S. BENSON & Co., LTD., London.—This company is winding up voluntarily, with Mr. H. C. Rabbidge, 32, Poultry, E.C., as liquidator. Meeting of creditors, June 28th.

Trade Announcements.—MESSRS. TOFIELD & ROBINSON, LTD., of 165, Edmund Street (and Lionel Street), Birmingham, have recently purchased the Birmingham business of Messrs. Handley & Robinson, Ltd., of the same addresses. They have also acquired offices and stores in London. In addition to being contracting engineers, they hold a stock of A.C. and D.C. motors.

MR. BEN CROSLAND, electrical engineer and contractor, of Bradford Road, and 3, Branch Road, Batley (Yorks.), has been joined in partnership by Mr. H. Bateson, of Bradford, and the business will be conducted under the style of Crosland & Bateson.

MR. J. G. ROYCE, of 37, Victoria Street, Bristol, has been appointed by the Hart Accumulator Co., Ltd., of Stratford, London, as their agent for the sale of the "Hart" storage battery in the south-west district of England (the counties of Gloucester, Somerset, Devon, Cornwall and Dorset).

THE B.E. CO. (OF LONDON AND BIRMINGHAM), LTD., states that it is desirous of appointing agents for many parts of the United Kingdom.

THE BRITISH ELECTRIC TRANSFORMER CO., LTD., of "Tricity" Showrooms, Oxford Street, W. 1, has had an additional telephone line installed ("Museum 5880") to cope with increased business.

The German Transmarine Electricity Co.—The shareholders in the Deutsch-Ueberseeische Elektrizitats Gesellschaft of Berlin have now approved the transfer of the undertaking to a Spanish group. At the recent meeting the chairman mentioned that offers had been received from countries of the Entente to take over the concern, and also from a Swiss group, but the most favourable proposal to the company was that made by the Spanish group of banks. The company realised net profits of 2,115,000 marks in 1919, as compared with 2,372,000 marks in the preceding year, and a dividend at the rate of 6 per cent. has been declared on the preference capital, as in 1918.

Catalogues Wanted.—MESSRS. STEEL MORRISON AND Co., Sprowston Works, Sprowston Road, Forest Gate, E. 7, electrical and general engineers, wish to receive catalogues and lists from electrical manufacturers and dealers.

MESSRS. BURRELL, RUSSELL & Co., 104, Shenley Road, Camberwell, S.E. 5, ask for manufacturers' catalogues of everything electrical suitable for contractors, also shafting.

Dissolution of Partnership.—BAKER & HYMAN, electrical manufacturers, automobile and general engineers, 11 and 13, Portland Crescent, Leeds.—Messrs. W. T. Baker, H. W. Baker, and H. Hyman have dissolved partnership. Messrs. W. T. Baker and H. Hyman will attend to debts and continue the business.

For Sale.—The Disposal Board, Ministry of Munitions, is offering for sale by tender the plant for the production of hydrogen and oxygen by electrolysis, situated at Grand Tuevilly, near Rouen. For full particulars see our advertisement pages to-day.

Manchester Corporation electricity department invites offers for 13,000 pairs of Columbia carbons, and 2,000 pairs Conradty carbons for open-type arc lamps. For particulars see our advertisement pages to-day.

Book Notices.—"Caledon Welfare Magazine." Vol. I, No. 1. (24 pp.) Price 6d. London: Industrial Welfare Society.—A new works journal just issued by the Caledon Shipbuilding Co. The first number includes, among notices of the many social activities of the firm, an article on the ethics of Sportsmanship, by Lieut.-Col. E. A. Berrisford, M.C., President of the Oxford University Boating Club, and a clever cartoon by Mr. Bert Thomas, caricaturing the suggestion that music might be introduced to accompany the more monotonous tasks in industry. There are other contributions on motor cycling, athletics, allotments, the effect of mechanical inventions on the working man and boy life in China, with two pages devoted specially to women. The magazine is well printed on good paper, amply illustrated, and neatly laid out.

"Safety First." The *Journal* of the British Industrial Safety First Association, No. 2. May, 1920. (16 pp.).—A report of the first annual general meeting and the first annual dinner is included in this issue. Other interesting items are notes on "Safety First," from a variety of sources, industrial and otherwise.

"Faraday House *Journal*. Vol. III. No. 6. (Summer Term, 1920). (18 pp.).—This issue includes an interesting and informative paper on "The Electrostatic Capacities of Cylindrical Conductors," by Dr. Alexander Russell (Principal), as well as an account of the annual dinner of the Old Students' Association. Lists of examination results and recent appointments secured by students are given.

Scientific Paper No. 378 of the U.S. Bureau of Standards, "A New Spectropyrheliometer and Measurements of the Component Radiations from the Sun and from a Quartz Mercury Vapour Lamp." Pp. 17. Washington: Government Printing Office. Price 5 cents.—The instrument described consists of a quartz spectrograph and cylindrical condensing lens, placed upon an equatorial mounting. In this manner the ultra-violet absorption in heliostat mirrors is avoided. Notes on the relative components of infra-red, visible and ultra-violet rays from the sun and from a quartz mercury arc lamp, are given.

"Elements of Electrotechnics." By A. P. Young. Pp. viii + 348; 179 figs. London: Sir I. Pitman & Sons. Price 7s. 6d. net.

"Steam Turbines." By J. A. Moyer. Pp. xi + 496; 222 figs. London: Chapman & Hall. Price 21s. net.

Bankruptcy Proceedings.—HORACE HENRY SHAVE (trading as H. H. Roberts), electrician, 228, Sultan Road, Portsmouth.—The public examination of this debtor was held at Portsmouth on June 7th. In answer to the interrogation of Mr. G. S. Hopkins, the Deputy Official Receiver, the debtor said he joined the Navy as a domestic in November, 1906, and left in March, 1908; he rejoined as officers' cook in December, 1913, and finally left in September, 1916, for medical reasons. He then travelled in the sale of enamelled letters, out of which he made a livelihood, until October, 1919, when he commenced trading on his own account as an electrician. He had had some experience in electrical work, having previously been employed in the telephone service. When he commenced on his own account he had no capital beyond £13 5s., the amount of his gratuity on leaving the Service. The six months which he had been in business had barely paid him a living profit, and in October he was obliged to suspend his operations, owing chiefly to the difficulty in getting the necessary tubing. He continued for some time after the knowledge of his insolvency, in the hope that matters would improve. He became aware of his insolvency about five weeks prior to filing his petition. He had kept no books of account of any description, and in applying for work he had underestimated the cost of it, and this had been one of the things which led to his failure. The liabilities amounted to about £85, and the assets were of the net value of £11, leaving a deficiency of £74. The examination was closed.

E. S. ELAM and J. WALTON (Elam, Walton & Co.), electricians, 63, King Edward Street, Kingston-upon-Hull.—Receiving order made June 8th. First meeting June 25th; public examination, July 12th.

GEORGE FREDERICK KIVERON, electrical engineer, Goulders Place, Attercliffe Common, Sheffield, late 38, Shrewsbury Road, Sheffield.—The public examination of this debtor was held on June 10th, at the County Court Hall, Bank Street, Sheffield. According to the statement of affairs submitted, his liabilities amounted to £664, and assets £330. Debtor stated he was Dutch, and came to this country in 1909, and set up business in 1918 after serving in the Army. His stock was supplied on credit, and the business was very successful at first. His business was so successful that at one time he had to employ nine men. Since July last, however, the business had not been so successful, and he had lost money on contracts. He had started books, but as he could not write English very well, he had got mixed up. The examination was adjourned.

Catalogues and Lists.—AUTOMATIC AND ELECTRIC FURNACES, LTD., 281-283, Gray's Inn Road, W.C. 1.—Advance copy of a new catalogue (15 pp.) of "Wild-Barfield" electric furnaces. Owing to the advance in mass production methods, larger sizes have been developed, and furnaces for the hardening of long articles, such as cam-shafts, tools, &c., are being manufactured.

THE BRITISH-THOMSON-HOUSTON CO., LTD., Rugby.—Descriptive List No. 4154 B (32 p.p.), dealing with ironclad oil-break switchgear of many types. Profusely illustrated throughout, and giving ordering instructions.

MESSRS. WERTHEIMER & WHITE, 64, Victoria Street, S.W. 1.—Leaflet describing Dawson hardened copper and its various uses.

THE B.E. CO. (OF LONDON AND BIRMINGHAM), LTD., Hendon House, 57, Upper Thames Street, E.C. 4.—Illustrated leaflet giving descriptions and prices of "Hendon" British-made drawn wire lamps.

MESSRS. WATSON & SONS (ELECTRO-MEDICAL), LTD., Sunic House, Parker Street, Kingsway, W.C. 2.—Bulletin 25 S. An illustrated and priced pamphlet (16 pp.) dealing with "Sunic" X-rays tube stands and radiographic couch.

THE ILFORD DRY BATTERY CO., LTD., 83, Wool Exchange, Coleman Street, E.C. 2.—Illustrated leaflet dealing with the "Inert" combined battery and case.

THE GENERAL ELECTRIC CO., LTD., 67, Queen Victoria Street, E.C. 4.—A well-illustrated catalogue (X section, 13th edition, 36 pp.) dealing with switchboards and switchgear, sealing boxes, &c. Fully priced.

The Anti-Dumping Bill.—The Prime Minister cannot at present name a date for the re-introduction of the Anti-Dumping Bill.

Holidays.—MESSRS. A. REYROLLE & CO., LTD., of Hebburn-on-Tyne, notify that their works will be closed from Saturday, June 19th, until Monday morning, June 28th, it being Race Week.

LIGHTING AND POWER NOTES.

Accrington.—YEAR'S WORKING.—A loss of £989 was incurred by the electricity undertaking during the year ended March 31st last. Although the units sold fell from 6,948,390 to 6,705,274, the revenue increased from £45,223 to £57,450.

Athy (Co. Kildare).—ELECTRIC LIGHTING SCHEME.—The estimated cost of the proposed electric lighting scheme for the town is stated at £13,000.

Australia.—TASMANIA.—HYDRO-ELECTRIC SCHEME.—Giving evidence at Queenstown before the Public Works Committee on the matter of the construction of a road to link up Hobart and the West Coast, Mr. Huntly Clark, engineer of the Mount Lyell Co., said that the proposed King River hydro-electric power scheme would be capable of yielding 70,000 H.P. He had the data of four schemes within 10 miles of Queenstown, with a total of 110,000 H.P. The proposed road from Gormanston to Lake St. Clair would be invaluable for the distribution of power to other parts of the State.

MELBOURNE STRIKE.—Owing to a strike of employés at the power stations, the public services have been suspended. It is feared that the strike will become general.

MUNICIPAL UNDERTAKINGS IN N.S.W.—The report of the Local Government Department of the New South Wales Legislature for the year ended June, 1919, shows that 7 out of 14 electricity trading undertakings sold electricity at less than its cost price, the loss ranging from 5·33d. per unit to ·21d. per unit. The largest loss per unit of electricity was incurred by the undertaking at Tenterfield, but as trading operations did not commence until 1917, the result for the year under review cannot be considered as indicating the result which will be obtained when the undertaking has become thoroughly established. Five undertakings show profits varying from 1·29d. per unit in the case of Broken Hill to ·44d. per unit at Goulburn. The particulars of the units of electricity sold by the undertakings at Moss Vale and Penrith were not furnished to the Department. There was, however, a loss in trading at Moss Vale, and a profit at Penrith. All but three of the electricity trading undertakings show a net return on the capital invested. The highest return, viz., 13·21 per cent. on the capital invested, is shown by the undertaking at Broken Hill. The undertaking at Goulburn

shows a return of 8·46 per cent., that at Tamworth 8·16 per cent., and that at Newcastle 7·69 per cent. on the capital invested. The most striking result is shown by the Newcastle undertaking. It has been converted from an unprofitable to a very profitable concern during recent years. Moreover, this result has been achieved by trading operations only. The ratepayers have not been asked to assist the undertaking by levies in the form of loan rates.

Ballycastle (Co. Antrim).—PUBLIC LIGHTING.—At the last monthly meeting of the Urban Council a communication was read offering the local gasworks for sale. The chairman said that, so far from buying over the gasworks, the town should be lighted by electricity, and several members concurred that when the Council had waited so long it should wait till it could have electric light.

Bangor.—YEAR'S WORKING.—In his annual report for the year ended March 31st last, the electrical engineer announces a gross profit of £1,058. The Corporation is urged to reopen negotiations with the North Wales Power Co. for a bulk supply, in order to obviate the increases in price which will be necessary if the present plant remains the sole source of supply.

Barrow.—ELECTRICITY SUPPLY.—In Committee, the Council decided to defer a recommendation from the Electricity Committee to approve of a resolution "that an adequate supply of electricity is necessary for the industrial development and well-being of this district. In order that this supply may be provided, and the sources of power available in the district may be utilised to the greatest advantage, this Council considers that a Joint Electricity Authority should, with the least possible delay, be constituted for the Furness and South Cumberland District, under the Electricity Supply Act, 1919, and undertakes to co-operate in the formation of such authority. The Council, therefore, requests the Electricity Commissioners to take the necessary steps for determining the area of the district, and for the establishment of a Joint Electricity Authority."

Bootle.—PROPOSED EXTENSIONS.—It was stated at a recent Council meeting that Liverpool was unable to meet the obligation to provide a bulk supply at a moment's notice under the linking up agreement, and it was, therefore, decided to apply for permission to augment the generating plant. Sanction is being sought to a loan of £40,000.

Brighton.—EXTENSION OF AREA.—The supply area of the Brighton undertaking will, no doubt, be greatly extended in the near future. Hove has already accepted the terms for a bulk supply, and Portslade, Southwick, Shoreham, Newhaven, and Rottingdean, are also considering taking supplies from Brighton.

Burton-on-Trent.—POWER SUPPLY.—The Town Council has applied to the Board of Trade for permission to supply electricity to several South Derbyshire manufacturers whose works are outside the area of supply.

Bury St. Edmunds.—EXTENSIONS.—In adopting the Electricity Committee's report, the Council decided to apply for sanction to borrow £12,200 to carry out necessary extensions, and to cover expenditure already made in this connection.

Continental.—FRANCE.—The Brussels company, which is the concession-holder for the supply of electricity in many localities of the Département du Nord, has applied to the French Government for an increase of the rebate allowed on English coal from 150 to 250 fr. per ton; also for an increase in the tariff charges for gas and electricity allowed in the localities served. The high cost of imported coals causes a loss on the undertaking. Another aspect of the coal question has arisen in connection with the Government's restrictions of the periods of electric lighting. The Mayor of Toulon had applied to the Minister of the Interior for exemption from the restrictions on the ground that the electricity supplied to the city was water-generated. The argument was cogent, and seemed unanswerable; but the Minister replied that the surplus in Toulon resulting from the restrictions would be available in neighbouring localities, and, moreover, no exception could be made in the case of any city, like Toulon, more favourably situated than others.

SPAIN.—The report of the Sociedad Hidroelectrica Espanola, at the general meeting in March, was mainly concerned with the progress made with the new station at the Dos Aguas Falls, on the Jucar River. This, if no unforeseen hindrances occur, is expected to be completed by the middle of next year, in anticipation of which contracts have been placed for all the hydraulic and electrical plant needed for its working. The output of all the company's undertakings in the past year totalled 130,175,158 KW.-hours, or 14,129,420 more than in the foregoing year. The price of coal, which continued abnormally high, had caused heavy losses in the thermic stations, having amounted to 2,075,000 pesetas, or about 1,300,000 more than in normal years. In hopes of the early inauguration of the Dos Aguas Falls station, demands for power had come in from the whole region of the Levant, the most important industries being represented, and, if success crowned their efforts, as was confidently expected, all the places which constituted their market would be amply served. The profit and loss account showed a profit, including the balance from previous years, of 3,708,804 pesetas, which is distributed as follows:—5 per cent. to reserve, 185,440 pesetas; Council's fees, 7½ per cent., 278,160 pesetas; dividend of 5 per cent. on Coupon No. 11, 1,000,000 pesetas; ditto on Coupon No. 12, 1,000,000 pesetas; dividend tax, 65,740 pesetas; company's Benevolent Fund, 20,000 pesetas, and balance carried forward, 1,159,464 pesetas. This result confirmed the anticipations of the report for 1919, and constituted an assurance for the future. The Electra de Lima (Portugal)—an offshoot of the company—had increased its capital from 4,000,000 to 10,000,000 pesetas, which had been distributed among holders of shares in circulation. With the help of most important industrial concerns, the Hidroelectrica had contributed to the creation of the Sociedad de Electrificacion Industrial, with a capital of 5,000,000 pesetas. The objects of this company were the electric conversion of transport, the study and development of large waterfals, and the manufacture of electrical machinery. Other companies in which the Hidroelectrica has interests are the Union Electrica de Cartagena and the Co-oporativa Electra de Madrid.

Concessions have recently been granted for the establishment of plants to utilise the water power of the Tajo by the Sociedad Hidroelectrica Lobinillas, and of the rivers Bairola, Chisaguer and Cinca, in the Province of Huesa, by the Sociedad Hidroelectrica, Iberica.

Darwen.—BULK SUPPLY.—The Corporation has decided to arrange for an additional supply of electricity from Blackburn. High-tension mains are to be laid underground from the borough boundary to the electricity works, at an estimated cost of £27,000. It is anticipated that the supply will be available for the coming winter.

Dorchester.—PROPOSED MUNICIPAL PURCHASE.—The Town Council has decided, in response to a letter from the Electric Light Co., to re-open negotiations for the purchase of the local electricity undertaking. An offer of £8,500 had been made, but this was refused by the company.

Houghton-le-Spring.—HOUSE LIGHTING.—The Urban District Council has decided to approach the Electric Light Co. as to a supply of electricity to the houses being erected by the Council.

India.—MYSORE ELECTRICAL SCHEME.—There are several schemes before the Government for the purpose of still further developing the Cauvery Falls. The immediate needs of the State of Mysore, the cities of Mysore and Bangalore, the Gold Fields of Kolar, &c., are met by the existing 25,000 H.P., but in the near future more power will be needed, and to that end the Government has sanctioned a sixth installation at Sivasamudram. Much of the old plant, which has done good service, is to be scrapped. The new installation will supply the Kolar Gold Fields and Bangalore. In addition to this, the other schemes before the Government include the harnessing of the Shimsha Falls and the Mekadatu Falls. The potentialities of the Shimsha Falls are said to be great. The late Captain Dawes, who lost his life in the survey of the Cauvery, expected to get by pipe line a clear fall of 720 ft., taking the supply 40 miles up river. The scheme would probably cost about 70 lakhs of rupees. The scheme at Mekadatu is much smaller, and would cost about 39 lakhs of rupees. The electrical engineer has given his opinion to the effect that the Falls should be utilised as speedily as possible. It is estimated that when all the schemes have materialised the combined power will represent 100,000 H.P. at the very least. The price of coal in India is now prohibitive, so that a cheap power supply is absolutely necessary.

Kettering.—LOANS SANCTIONED.—The Electricity Commissioners have sanctioned loans for £9,284 for plant at the Urban District Council's electricity works.

Lincoln.—YEAR'S WORKING.—The report on the electricity undertaking for the year ended March 31st last, records an increase in revenue of £25,332 and an additional expenditure of £22,202. The net profit for the year was £3,141, which, with the balance brought forward, totals £5,124. £5,000 is to be placed in the depreciation fund.

EXTENSIONS.—The ultimate cost of the St. Swithin's extension scheme, which was originally estimated at £250,000, is now stated to be £400,000.

Liverpool.—NEW SWITCHGEAR.—Switchgear in connection with the new generating plant at Lister Drive power station is to be purchased by the Liverpool Corporation at a cost of £6,693.

London.—ST. MARYLEBONE.—The Borough Council is applying to the Electricity Commissioners for permission to give a bulk supply to the Hampstead Borough Council, and for sanction to the expenditure of £9,500 for the provision of the necessary cables.

ELECTRICITY CONSUMPTION.—The London County Council has prepared a return relating to the supply of electricity in and around the County of London. The total number of units sold during the year 1917-18 was, after allowing for intersales, 449,686,063 by the London undertakings, and 167,204,097 by the extra-London undertakings. These figures show increases in the period of four years since 1913-14 of 130,715,453 units, or 41 per cent., and 39,858,827 units, or 31·3 per cent. respectively. The analysis of the 449,686,063 units sold by the London undertakings gives the following results:—Public street lighting, 9,018,088; other lighting, 115,105,312; power, heat, and traction, 318,903,616; and bulk, 6,659,047. It will be seen that power and heat supplies account for 71 per cent. of the total units sold, and that such supplies were nearly three times as great as those for private lighting.

NON-UNION LABOUR.—As announced in our "Correspondence" columns, the Trade Unions represented on the Joint Industrial Council for Electricity Supply, No. 10 (Greater London) Area, have decided to cease work on July 1st if any non-Union labour is employed in any supply undertaking in the district, and from that date will refuse to connect up work done by non-Union labour.

Malton (Yorks.).— PUBLIC LIGHTING.—The Urban District Council has accepted the tender of the Northern Counties Electric Supply Co. for lighting by 124 50-C.P. lamps for three years, at £580 12s. 6d. per annum.

Manchester.—SALE OF UNDERTAKING.—The Corporation has accepted an offer from the Stockport Corporation for the purchase of the Heaton Norris undertaking. It has also arranged to give a bulk supply to Stockport for a period of 10 years.

BULK SUPPLY.—An application from the Lancashire Power Supply Co. for a supply of electricity from the new power station at Barton, when completed, is under the consideration of the Electricity Committee.

Market Drayton.—PUBLIC LIGHTING.—The Urban District Council has asked the Electric Light Co. to submit an estimate for public lighting, and the conversion of the gas lamps.

Navan (Co. Meath).—LIGHTING SCHEME.—At a special meeting of the Council, on Thursday last, Mr. J. J. Woods, consulting engineer, was in attendance, and submitted three alternative schemes for the lighting of the town. The first was estimated at £12,090, and the generating and distributing costs at 10¾d. per unit, suction gas engines to be the prime movers. The second scheme included the purchase of the local gas company's premises, and generating with town gas. The estimated cost, exclusive of the purchase of the gas works, was £10,245, and the generating and distributing costs, 11·4d. The third scheme was the offer of a local saw mill owner to supply power, the Council installing all the necessary electric plant. The estimated cost was £7,835, and the distributing cost 6·15d. After the various schemes had been explained in detail, the last was adopted, subject to the Council's ability to obtain a satisfactory lease of the land for generator, battery and switchboard-rooms.

Newhaven.—ELECTRICITY SUPPLY.—It is stated that the cost of providing the necessary plant for supplying Seaford and Newhaven from the Eastbourne station would be £25,000, and the Electricity Commissioners consider that it will be more advantageous to supply the towns from Brighton.

Nottingham.—ELECTRICITY SUPPLY.—The Corporation received a letter from the Derbyshire and Notts. Electric Power Co., stating that the company was about to erect a new station on the Trent in accordance with a programme arranged prior to the war, but temporarily suspended. The company intimated its preparedness to enter into an arrangement to supply the Corporation, but the chairman of the Electricity Committee urged the Corporation to reserve the right to supply electricity in the Nottingham area to itself. A motion to postpone consideration of the Electricity Committee's report upon extensions was negatived, and the proposed scheme will be proceeded with.

Portrush.—EXCLUSION FROM AREA.—At a meeting of the Urban District Council a petition was submitted from residents of Dhu Varren protesting against the exclusion of that area from the proposed electrical supply scheme. It was explained, however, at the meeting that if the loan of £15,000 was sufficient, both the old and new areas would be embraced in the scheme, but, if not, Dhu Varren would be provided for in a separate scheme.

Rochdale.—YEAR'S WORKING, &C.—The electricity output for the year ended March 31st, amounted to 15,295,789 units, an increase of 5·4 per cent. on the previous year. The increase in consumers, particularly for lighting has been the greatest recorded, and the result for the year's working shows a surplus of £14,320 18s. 11d., of which the Committee recommends that £5,000 be placed to the relief of the rates, and the remainder allotted to the reserve fund, which now stands at £12,871. The Committee has decided to negotiate for a further bulk supply from the Lancashire Electric Power Co. of 8,000 KW., and to lay new E.H.T. mains to the districts of Firgrove, Balderstone, and Spotland. The application made for sanction to the borrowing of £68,500 has been granted without the necessity of a local inquiry.

Sheffield.—NEW POLICY.—When the question of increased charges was introduced at the recent Council meeting, Mr. J. G. Graves moved the rejection of the report, and put forward a proposal to charge for lighting and power on the same basis. From the subsequent discussion, in the course of which Mr. Graves's proposal was designated as sentimental and unbusinesslike, it would appear that his object was to reduce lighting charges to the same level as power charges, which, it was stated, would cause an annual loss of £51,211. Mr. Graves's contention was that as the same machinery and cables were used for both purposes, the cost to each class of consumer should be the same. The amendment was carried by a vote of 24 to 21.

South Africa. — EXTENSIONS AT PRETORIA. — The Pretoria Town Council has received authorisation from the Government for capital expenditure amounting to £261,000. The bulk of the money will provide for additional electric power stations, consisting of a new generating station at Mitchell Street, equipped with 6,000 KW. of plant, and a 3,000-KW. sub-station at Schoeman Street. The estimated cost is £200,000, inclusive of £15,000 for the construction of a dam on the western town lands to provide water for a new power station, Pretoria iron mines, and other industrial undertakings. To provide for a "make-up" of at least 500,000 gallons per day, an additional expenditure of £25,000 will be necessary on the dam. These proposals are part and parcel of the development of Pretoria West as an industrial centre. —*Board of Trade Journal.*

ELECTRIC LIGHTING SCHEME.—The Standerton Town Council has approved a scheme prepared by Mr. Hodge, the town engineer, which provides for a steam engine and generator for three-phase current at 3,300 volts, 50 cycles, with high-tension cables laid to distributing centres, transformed down to 415 volts for power, and 230 volts for lighting, and for the pumping station a 3,300-volt overhead transmission line. Following are the figures of estimated cost:—Buildings, £2,000; 130-KW. plant, £8,450; water service, £100; distribution, £1,500; transmission line to pumping station, £1,950; electrification of pumping station, £1,650; for contingencies and possible advance in prices, £1,350; total, £17,000.—*Engineering in South Africa.*

Stoke-on-Trent.—ELECTRICITY SUPPLY.—It was stated at a recent Council meeting that consumers in the Fenton district had complained of an inadequate supply of electricity, although a bulk supply was being transmitted to Newcastle. The chairman of the Electricity Committee pointed out that the Electricity Commissioners had ordered this bulk supply as a part of a general scheme, and the Council was bound by a 10 years' agreement.

Stratford-on-Avon. — PURCHASE ABANDONED. — The Town Council has decided to discontinue the negotiations for the purchase of the undertaking of the electricity company. The Council has agreed to the company increasing the charge for electricity up to 1s. per unit.

Sudbury.—ELECTRICITY SUPPLY.—Unanimous approval has been given by the Council to a scheme for the supply of electricity to the town, proposed by the East Anglian Electricity, Ltd. The company intends to erect a 600-H.P. station, and to utilise the old post office as a showroom. Distribution will be effected by low-voltage overhead lines, and it is hoped to be able to supply at cheap rates.

Sunderland.—EXTENSIONS.—The Corporation electricity department has engaged the British Engine, Boiler, and Electrical Insurance Co. to supervise the construction of the new boiler house plant and installation at Sunderland; 3,208 square yards of land have been bought in Farrington Row, at a cost of 10s. per square yard, for the purpose of the extensions.

Trowbridge.—PUBLIC LIGHTING.—The Urban District Council has invited the E.S. Co. to submit a price for public lighting in competition with the gas company.

Walsall. — EXTENSIONS. — The Corporation Electric Supply Committee proposes that, with a view to meeting demands for electricity, extensions of mains and feeders be carried out to supply current to certain premises, at a cost of £1,470; and, further, that application be made to the Electricity Commission for sanction to borrow £15,000 for the purposes of the undertaking, including £12,000 for extensions of mains.

Wimbledon.—LOANS SANCTIONED.—The Town Council has received consent to a loan of £15,000 for mains and services, and £2,100 for transformer sub-stations, and also permission to install two boilers, &c.

Wolverhampton.—NEW PLANT.—The electrical engineer has been authorised to negotiate and arrange for the supply of an additional 500 KW. of converter plant, at a cost not exceeding £3,000, plus 10 per cent. for contingencies.

TRAMWAY AND RAILWAY NOTES.

Accrington.—YEAR'S WORKING.—There was a loss of £295 on the tramway undertaking for the past year. Revenue increased to £50,153 from £41,633, and the working expenses also increased in proportion. The total amount taken from the rates since the system was inaugurated, and not yet repaid, is £4,558.

RENEWAL OF TRACK.—It was stated at a meeting of the Town Council that in three years' time it would be necessary to relay the tramway track at an estimated cost of £60,000 to £70,000. The fares are to be increased 50 per cent.

Bolton.—PROBABLE EXTENSION.—The Tramways Committee here, faced with possible motor-omnibus opposition from Wigan, is considering extending the tramway system to the industrial township of Westhampton.

Bradford.—TRAMWAY LOSSES.—At last week's full City Council meeting it was stated that the tramway undertaking was losing money at the rate of £30,000 a year. It was decided to call a special Committee meeting to deal with the matter, and recommend to the Council what steps should be taken to increase the revenue. It is considered extremely likely that some adjustment of stages will be made whereby 1d. stages, but for shorter distances, can again be introduced.

INSPECTORS' WAGES.—At a recent City Council meeting the weekly wages of tramway inspectors were raised to £5, instead of £4 15s., as had been previously recommended.

Burton-on-Trent.—FARE INCREASE.—The proposal of the Public Works and Tramways Committees to increase the fares and make 2d. the new minimum, with the exception of workmen's and children's tickets, has been approved by the Town Council. An amendment in favour of overlapping 1d. stages was defeated.

Continental.—SPAIN.—The Commercial Secretary to H.M. Embassy, Madrid, states that application has been made by the "Banco Espanol de Credito" for authorisation to install a Metropolitan Railway at Bilbao, the estimated cost of which is 13 million pesetas.

The scheme consists of two lines. The first starts from the Square de los Santos Juanes, and passes through a tunnel and in a straight line to the Institute, with an underground station which will link up the Lezama Railway. The line continues to the railway station of Las Arenas, and here another underground station is to be constructed, which will be called Arenal, between the Church of San Nicolas and the Bank of Bilbao; from here, in a straight line, and passing under the River Nervion, the line goes on to the Plaza Circular, where there will be another station, with lifts; it then continues along the Gran Via, with a station at Diputacion, Plaza Eliptica, Park, and San Mamos, and twists to the left, following the Alameda, with two stations, called Alameda and Basurto, and going on to La Casilla, where the first line terminates.

The second concession starts from the Casilla Station, the terminus of the first line, and goes on through the Calle de la Autonomia, with stations at Echaniz, Amezola, and Plaza de Zalalburu; it then passes through the San Francisco quarter, with stations called San Francisco, Miravilla, and Bilbao la Vieja, and, crossing the river over the San Anton Bridge, joins the first line at the station at Achuri.

The lengths of these two lines are respectively 3,458 and 1,949 metres, and the estimated cost respectively is 8,205,679 and 4,554,192 pesetas.

A double line will be constructed of 1-metre gauge, as it has been considered preferable to adopt this kind of line, which allows of the joining up of the Metropolitano with all the narrow-gauge stations of Bilbao, which will then be able to carry goods trains during the night, when the passenger traffic has ceased.

In consequence of the large number of stations projected, situated at distances between 200 and 300 m. apart, all the principal centres of the town will be served, reducing the congestion in the streets, and increasing the rapidity and economy of communication between the different quarters.

Dublin.—WAGE INCREASE.—Negotiations between the Dublin United (Electric) Tramway Co. and their employés have resulted in an increase of 8s. per week for every worker over 18 years of age, youths under 18 to receive 4s. per week, vanmen and parcel checkers 6s., women 4s., and boys 2s. Before this latest arrangement motormen were paid £3 10s. 5d. for a six-day week, and conductors £3 8s. 1d., with extra pay for Sunday work.

Huddersfield.—FARE INCREASE.—The car fares were increased on June 12th. No alteration has been made in the 1½d. and 2d. fares, but the longer distance fares have been advanced by approximately 50 per cent. Children's fares have now a 1d. minimum, as against ½d., with half-fares for other rates. The recent wages award of 10s. per week will cost the Committee £16,000 a year.

In consequence of numerous public requests for more, and later, Sunday evening car facilities, the tramway manager has requested the tramwaymen to work an hour longer on Sunday evenings. A ballot is being taken by the men on the question.

Leeds.—FARE INCREASE.—The increased tramway fares decided upon by the City Council took effect on June 10th. The receipts on that day were £2,451, from 359,381 passengers carried. On the previous Thursday the figures were £2,129 from 363,804 passengers. The returns at present are fluctuating and unreliable as a basis upon which to judge the effect of the increase.

London.—UNDERGROUND FARES.—A Select Committee of the House of Commons has passed the London Electric Railway Companies (Fares) Bill, thereby giving assent to the temporary raising of the maximum scale of fares and charges proposed by the promoters. Clauses were adjusted, and the effect of the Bill, as it now stands, is to give the companies a temporary power to charge a maximum fare at the rate of 1½d. a mile third-class and 3d. a mile first-class. They have also obtained the power to charge a minimum initial fare of 2d. third-class and 4d. first-class, however short a distance the passenger may travel. Workmen's return tickets may be issued at the price of a single ordinary fare.—*Morning Post.*

SHORT STRIKE.—On June 10th the wiremen at the Brimsdown power station ceased work owing to delay in paying increased rates. The matter was settled in a few hours, and a stoppage of the Metropolitan Electric Tramways thereby averted.

New Zealand.—CHRISTCHURCH.—The revenue account of the Christchurch Tramway Board for the year ended March 31st shows a deficiency of £1,237, as against a surplus of £2,741 for the previous year. The earnings were £205,976, operating expenses £145,960, and standing charges £61,253. The position was regarded as satisfactory considering the increases in wages and cost of material and the trouble incurred during the year. The deficiency is the first since the inception of the tramways.—*Auckland Weekly News.*

North-Eastern Railway.—EXPERIMENT.—In order to determine whether it was practicable to employ a third-rail system with a shoe fitting underneath the flange of the rail, the N.E. Railway Co. has been conducting experiments on a specially constructed part of the track between York and Scarborough. The chief point of investigation was the engaging of the shoe with the rail after the passing of a "railless" portion of the track, as it is intended to use this method in conjunction with an overhead trolley system, the latter to be employed in negotiating long crossings, shunting yards, and stations. It is understood that the system proved quite satisfactory in this respect even when high speeds were employed. This is the first trial of the system in this country, although it is being satisfactorily employed on the Central Argentine Railway. The latter system was described in the ELECTRICAL REVIEW of November 1st, 1918 (p. 411).

Nottingham.—YEAR'S WORKING.—The total revenue for the past year's working was £378,948, and the expenditure totalled £294,224. The balance of £84,724 (which fell from £103,988 for the previous year) was distributed as follows:—£24,000 to rate relief, £24,286 to redemption of capital, £18,270 to reserve and renewals funds, £16,168 to interest on loans, and £2,000 to the accidents reserve fund. The total number of passengers carried increased by about 6 millions to 58,749,654, and the total mileage from 3,572,973 to 4,088,570. The total contributed to rate relief by the undertaking since 1902 amounts to £350,000.

South Africa.—JOHANNESBURG.—The tramway strike was settled on May 20th; the men gave way on all points, but the Council promised that an inquiry should be held into the working of the Advisory Committee. The feeling of the community was very strongly indicated against the strikers, and the Citizens' Protection League was able to maintain a voluntary system of motor transport for women workers and aged people. The strikers did not have the support of the other Unions.

EAST LONDON.—The strike of tramway employés is not settled, and the cars are still idle. The latest development is that the Council has given notice to the strikers to send in their uniforms, and has invited applications from men to run the service. These applications have been sufficiently numerous to enable the Council to decide to re-start the service with a fresh staff.

Thornaby.—POWER SUPPLY.—It was reported to the Town Council that in connection with the Teesside tramway arbitration the Joint Committee for Stockton and Thornaby had agreed that the power for this part of the system should be purchased from the Stockton Corporation Electricity Department, the latter undertaking not to make any "undue profit." The Corporation feels, however, that this is not sufficiently explicit, and Stockton has been asked to agree to a definite maximum rate of profit based upon the bank rate.

Tramway Dispute Settled.—The latest claim for higher wages by tramway employés has been settled. A flat rate increase of 9s. will be applied to the London area, and District Industrial Councils are to make awards of from 7s. to 9s. increase in their areas.

West Hartlepool.—YEAR'S WORKING.—There was a gross profit of £6,625 on the working of the tramways during the past year, and a surplus of £863 was carried to reserve.

Wolverhampton.—YEAR'S WORKING.—The gross profit on the tramways for the past year was £21,828, making with profits from the motor-char-à-bancs undertaking a total of £22,204. This has been distributed as follows:—Interest on capital, £4,660; income-tax, £4,214; repayment of loans, £6,564; additions and improvements, £928; and to reserve and renewals fund, £5,838. It is anticipated that £11,000 will be spent on reconstruction during the current period.

CHANGE OF SYSTEM.—The Tramways Committee recently reported to the Corporation upon the question of changing over from the present (Lorain surface-contact) system to overhead trolley working. The proposal was most opportune, as the existing track requires thorough renewal and a double track was already under consideration. The present single track is totally inadequate to meet requirements, and many arguments in favour of the introduction of the double-track overhead system were put forward. The cost of the scheme is estimated at £396,000, made up of the following items:—Overhead equipment, £50,000; 20 miles of track, £320,000; street alterations, £12,000; and special work, £14,000. The sale of old materials is expected to realise £21,000, leaving the estimated net cost at £375,000. The Council has decided to proceed with the change-over by easy stages; the first amount to be spent will be £50,000.

TELEGRAPH AND TELEPHONE NOTES.

Argentina.—WIRELESS CO.—The Compania Transatlantica Radio Telegraphica is reported to have been formed at Buenos Ayres to work the wireless concession granted to the Siemens and Schuckert group on March 15th, 1919. The ordinary shares for 4,500,000 Argentine dollars are intended to pay for the machinery and apparatus awaiting shipment in Germany, whilst the proceeds of the 3,000,000 dollars in preference shares are to defray the cost of erection of the installation and other works.

Direction-Finding Stations.—The following are the wireless direction-finding stations operated by the Royal Navy, under the conditions laid down for the use of these stations by the Mercantile Marine:—Amlwch, Berwick, Carnsore, Flamborough, Larne, Lizard, Peterhead, Rhyl, and Seaview (Malin Head). Rhyl is not fitted with transmitting apparatus, and is controlled by Amlwch. Seaview also has no transmitting apparatus, and is controlled by Malin Head, which keeps watch on 600 metres.—*Manchester Guardian.*

France.—WIRELESS TELEGRAPHS.—It is announced that the French wireless system is to be reorganised, special attention being paid to Colonial communication. Stations are to be erected, or existing stations are to be improved, at Jibuti, Dakar, Martinique, French Guiana, Tahiti, &c. It is also proposed to erect stations at Bordeaux and Lyons for commercial communication with the U.S.A.

India.—NEW CABLE.—It is understood that the fourth cable line which was to be laid between Bombay and Aden is now in working order; according to a mail dispatch it had developed some faults. The cable was laid by the Eastern Telegraph Co.

London.—TELEPHONE SERVICE.—In an article contributed to the *Telegraph and Telephone Journal*, Captain J. G. Hine states that 160 miles of new pole route were constructed in London during the past 12 months, bringing the total mileage of pole route to 2,780, and the open wire mileage to over 60,000. (A considerable amount of the open wire acquired from the National Telephone Co. has been replaced by underground wire.) Fifty miles of single pipe were laid, bringing the total to 3,625. Over 45,000 miles of underground wires were laid, bringing the total to over one million miles. Over 20,000 new lines were brought into use, and over 30,000 telephone stations connected with these lines.

AUTOMATIC TELEPHONES.—Mr. Illingworth (P.M.G.), in the House of Commons, said: The provision of a system of automatic telephone exchanges for so large an area as London presents peculiar difficulties. It is proposed to install one automatic exchange as soon as possible, and I hope the experience thus obtained may make it possible to frame a complete scheme. The existing exchanges would be replaced gradually, and it would be some years before an automatic system for the whole of London could be completed.—*Daily Telegraph.*

Strike of Wireless Operators.—The failure of the Marconi Co. to deal with a wages claim made on behalf of operators by the Association of Wireless Telegraphists led to a general strike, which commenced at 11.30 a.m. on June 15th. The Association states that the claim was made last September; but the Marconi Co., in a notice issued in reply, says that the request was not actually received until May 17th, and confirmed in writing five days later, and the matter has been placed in the hands of the Association of Engineering Employers. The claim is for a scale of pay rising from 48s. per week for the first year to 120s. in the ninth year, an eight-hour day, and the continuance of "war-risk bonus" as long as it applies to other seafarers. Upwards of 4,000 operators are affected, some of them being employed by Siemens Bros. and the Radio Communication Co.

Telephone Improvements.—Replying to a deputation which waited upon him at the General Post Office, on the defects of the telephone service, especially in districts swept by strong winds and severe storms, the Postmaster-General said the department was already engaged in a large extension of underground telephone lines in various parts of Lancashire and Yorkshire, which it was hoped would go far to obviate the trouble. Increased facilities were also being provided by the laying of new wires between Oldham, Manchester, Huddersfield, Liverpool, and other centres.—*Daily Telegraph.*

CONTRACTS OPEN AND CLOSED.

(The date given in parentheses at the end of the paragraph indicates the issue of the ELECTRICAL REVIEW in which the "Official Notice" appeared.)

OPEN.

Australia.—SYDNEY.—August 4th. N.S.W. Government Railways and Tramways. Two 1,000-KW. sub-station units. Chief Electrical Engineer, 61, Hunter Street, Sydney.

August 3rd. Department of Public Works. Turbines and generators for the Barren Jack hydro-electric development scheme. Department of Public Works, Sydney.

N.S.W.—Postmaster-General's Department. August 2nd and 5th. Aluminium sheet, brass rod, &c., scheduled 769; platinum wire, gold and silver wire, scheduled 768. (June 11th.)

WESTERN AUSTRALIA.—Postmaster-General's Department. August 3rd. 326 accumulators, schedule 668. (June 11th.)

Belgium.—June 22nd. Municipal authorities of Wevelghem. Tenders for two sub-transformer stations for converting three-phase, A.C. Particulars can be obtained from M. Goffin, 113, Avenue Albert, Brussels, and tenders are to be sent to La Salle Communale, Wevelghem.

June 26th. Municipal authorities of Voroux-Goreux (Province of Liége). Tenders for the concession for the electric lighting of the town.

Bedford.—June 21st. Electricity Department. One 2-ton locomotive jib crane, with grab and track rails, steam and other pipework. (June 4th.)

Canterbury.—June 22nd. Electricity Department. 1,210 yards ·25 sq. in. × ·25 sq. in. × ·125 sq. in. L.T. triple-concentric paper-insulated cable. (June 11th.)

Carlisle.—June 25th. Electricity Department. One 3,000-KW. turbo-alternator and condensing plant. (May 28th.)

Colne.—Electricity Department. Steam and water piping. (June 11th.)

Dartford.—June 26th. Electricity undertaking. Rotary converter, transformers, switchgear, &c., L.T. twin cable-feeder, pillar and feeder-panel. (June 11th.)

Dundee.—June 24th. Electricity Department. Steam feed and water piping, two turbine-driven feed pumps. (June 11th.)

Edinburgh.—June 19th. Electricity Supply Department. E.H.T. and L.T. switchgear, &c., for Portobello station. (May 21st.)

Glasgow.—July 6th. Tramways Department. One 10,000-KW. steam turbo-alternator, with condensing plant. (See this issue.)

Liverpool.—June 21st. Board of Guardians. Electrical supplies (three months) for the township of Toxteth Park. R. Albert James, Clerk to Guardians, 15, High Park Street.

Manchester.—June 25th. Electricity Committee. Twelve months' supply electricity meters, time switches, potential and current transformers, motor-starting switches, C.C. and A.C. motors. (June 11th.)

New Zealand.—AUCKLAND.—September 1st. Harbour Board. For the supply of electric capstans and spares. Messrs. W. & A. McArthur, Ltd., 18-19, Silk Street, Cripplegate, London.

Newport.—June 26th. Electricity Department. Turbo-alternating plant, surface-condensing plant, boilers, economisers, draught plant, steel flue and stack, &c. (June 4th.)

Nuneaton.—June 30th. Electricity Department. 1,000-KW., D.C., geared turbo alternator, surface-condensing plant and pipework. (June 4th.)

Salford.—June 21st. Electricity Committee. H.P. steel steam pipes and separator, and steel exhaust steam pipes and supports. Borough Electrical Engineer, Electricity Works.

Southampton.—July 3rd. Electricity Department. E.H.T. and H.T. switchgear and D.C. control panel. (June 4th.)

Swindon.—June 26th. Electricity Department. 2,000 yards 3-in. four-way stoneware conduits, light steel poles for overhead lines. (June 11th.)

Warrington.—June 29th. Electricity Department. Truck type ash elevator and hopper. (June 11th.)

July 13th. Electricity and Tramways Committee. Two 6,000-KW. turbo-alternators. (See this issue.)

CLOSED.

Bedford.—The Education Committee has appointed H. Bacchus, Ltd., as electricians for six months.

Clacton-on-Sea.—Urban District Council:—

English Electric Co.—Diesel engine, £7,040: generator, £1,714.

Doncaster.—Mr. R. B. Isle has secured the contract for the electric light installation at St. Andrew's Church.

Dundee.—The Tramways Committee has placed an order with an American firm for 1,000 tons of rails, at £24 6s. per ton, thereby hoping to save £4,000. The City Engineer was unable to obtain a lower estimate than £28 7s. 5d. per ton, including carriage, from a Middlesbrough firm.

India.—Messrs. Boving & Co. have received an order from the Mysore Government for four 5,600-H.P. turbines for the Cauvery River Scheme. Further reference to this contract appears in our "Business Notices" to-day.

London.—SHOREDITCH.—Electricity Committee.

5,000-KW. turbo-alternator, with condensing plant:—

	Price.	Efficiency at full load-lb. of steam per KW.-hour.	Delivery.
Met.-Vickers Elect. Co., Ltd. (recom.)	**£39,095**	**13·13**	**56 weeks.**
C. A. Parsons & Co.	43,000	12·6	64 ,,
British Thomson-Houston Co., Ltd. ..	39,880	13·7	52 ,,

The remaining offers, owing to low efficiency or high price, were not considered. 13 tenders were received, 10 from British firms, two from Swiss firms and one from Sweden.

	Price.	Efficiency.	Delivery.
BOILER PLANT.			
Clarke, Chapman & Co.	£18,196	80/81%	—
,, ,,	18,105	—	—
,, ,,	17,740	—	—
Baldwin Loco. Co. of America	18,600 about	not stated	about 8 mths.
Babcock & Wilcox, Ltd.	16,620	82%	11 months.
,, ,, (land type)	15,960	80%	11 months.
Stirling Boiler Co., Ltd.	**16,550** (recom.)	**82%**	**10 months.**
,, ,, (land type)	15,850	—	10 months.

The Committee recommends the acceptance of the tender of the Stirling Boiler Co., Ltd., for one marine-type water-tube boiler, with chain-grate stoker, superheater, economiser, steel chimney, &c., at £16,550.

Sunderland.—Electricity Committee. Accepted :—

New Switchgear Construction Co., Ltd.—E.H.T. switchgear.
Ferguson, Pailin & Co., Ltd.—L.T. links.
W. G. Farrow & Co.—Box frames and covers.
James Allan.—Box frames and covers.

Wolverhampton.—Corporation. Accepted :—

Six E.H.T. crucibles, £2,260.—Ferguson, Pailin & Co., Ltd.
Transformer oil filter, £178.—G. Lister.
One 500-KW. rotary-converter set, £3,210.—Met.-Vickers Electrical Co., Ltd.

FORTHCOMING EVENTS.

Ratti Wallahs' Society.—Monday, June 21st. At the Holborn Restaurant. Luncheon (Mr. Guy Campbell will tell of his recent trip to the United States of America).

Institution of Electrical Engineers (Wireless Section).—Wednesday, June 23rd. At 6 p.m. At the Institution of Mechanical Engineers. Paper on "The Development of Thermionic Valves for Naval Uses," by Mr. B. S. Gossling.

Physical Society.—Friday, June 25th. At 5 p.m. At the Imperial College of Science, South Kensington, S.W. Ordinary meeting.

Incorporated Municipal Electrical Association.—Annual convention at Bradford and Ilkley. June 21st to 26th.

NOTES.

Appointments Vacant.—Chief instructor in electrical installation and maintenance work, for the Bradford Technical College (£250) (training of disabled sailors and soldiers); chief telegraph inspector (Rs. 350 per month), for the Burma Railways Co., Ltd.; car-shed foreman for the London County Council tramways; assistant (£300 to £400) on the staff of the Institution of Electrical Engineers; evening lecturers in electrical engineering (Grades II and III), evening assistant lecturer (in one or all of the following: fitting and machinery, machine drawing, machine design, and practical mathematics), evening instructor in metal-plate work, Grade II evening assistant demonstrator in electrical engineering (labour) for the Goldsmiths' College, New Cross; technical assistant (Grade I) electrical branch (£300 + war bonus), ditto Grade II (£250 + war bonus), ditto Grade III (£200 + war bonus) for the London County Council tramways department; engineering draughtsman (£220 + £192), two ditto (£180 + £171) for Metropolitan Asylums Board; telegraph mechanicians (£440), for the Government of the Gold Coast Posts and Telegraph Department. For particulars see our advertisement pages to-day.

Hydro-electric Engineering.—Recently, at the request of Major C. E. Inglis, Professor of Engineering at Cambridge University, Mr. Douglas Spencer, of Messrs. Armstrong's Hydro-Electric Section, read a paper before the Cambridge engineering students on the subject of hydro-electrics and the British engineer, and at the close of the paper a selection of 12 candidates was made to undertake a journey to Norway to see Norwegian power plants, with a view eventually to a selection being made from their number to undergo a course of training in practical manufacture and construction in Norway.—*Financial Times.*

Birmingham Electrical Golfing Society.—The next competition will be held on the Castle Bromwich Course on Monday afternoon, June 21st, when the Electrical Trades Challenge Cup will be played for. There will be other prizes. The annual subscription is 7s. 6d., covering three meetings. Applications for membership should be addressed to Mr. W. A. Millinger (Hon. Sec.), 9, Livery Street, Birmingham.

Electrically-Propelled Ships.—The new U.S. battle cruisers *Saratoga* and *United States*, the keels of which have just been laid, will, says the daily Press, be equipped with a main battery of eight 18-in. guns. The vessels will be 850 ft. long, and of 43,500 tons displacement, with engines of 180,000 H.P., developing a speed of 33·25 knots. Four other battle cruisers, the *Constitution*, *Constellation*, *Lexington*, and *Ranger*, will mount main batteries each of eight 16-in. guns. All these ships are to be equipped to burn oil fuel, and are to be electrically driven.

A Corona Voltmeter.—An interesting paper in the May, 1920, issue of the American I.E.E. *Journal* describes an improved form of corona voltmeter. Precision measurements of crest values of high alternating voltage taken in the high-tension circuit are compared with the indications of the corona voltmeter. The law of corona has been determined to a higher degree of accuracy, and a modification in the form of the law as heretofore accepted is revealed. As based on the precision voltage measurements, the corona voltmeter is proposed as a natural secondary standard of high voltages. Its advantages as a standard, and its practical operation, are described.

Nickel-Plating of Aluminium and Aluminium Alloys.—Messrs. Guillet & Gasnier, in a paper read recently before the French Academy of Sciences, described some tests they had carried out to determine the possibility of obtaining satisfactory deposits of nickel on aluminium and its alloys. Another French worker had already obtained partial success by first scouring the metal in a solution of hydrochloric acid, but the resultant deposit was very uneven. The method of the two writers mentioned above consists in, first of all, sand-blasting the metal to be treated, the pressure of blast being 500 grams per sq. cm., and the sand just passing through a screen of 0·2 mm. mesh. This was followed by nickel-plating to a depth of some 6/100ths mm. The duration of the operation is half-an-hour, and the mean current-density 0·8 ampere per sq. dm. After this the nickel surface is copper-plated to a depth of 0·02 mm. for two hours, with a current density of 1 ampere per sq. dm., the surface obtained being carefully polished. The copper surface is then coated with nickel to a depth of 0·05 mm., the operation lasting for one hour, and the current-density being 0·5 ampere per sq. dm. Finally, the nickel-plated surface is polished. When this procedure is followed, the mechanical tests are satisfactory. The following were applied :—Penetration test for cracking; bending through an angle of 120°; burnishing. The chemical test consisted in subjecting the nickel-plated surface to a 15 per cent. solution of NaOH at a temperature of 100° C., and under these conditions the nickel-plating was found to be intact. The copper solution used in the tests in question consisted of 150 grams of copper sulphate, and 20 grams of sulphuric acid, with water to make up to 1 litre. The nickel bath was formed of 150 grams of double sulphate of nickel and ammonium and 50 grams of water, to make up to 1 litre.

Educational.—MANCHESTER COLLEGE OF TECHNOLOGY.—According to *The Times*, an important decision affecting the College of Technology has been taken. The college is a municipal establishment which has become the Faculty of Technology in the University of Manchester. Its degree courses have become more and more popular, and the college has attracted students from a wide area. It has, however, been urged that the development of the higher instruction of the college has been detrimental to the interests of young Manchester students not intending to take a degree course. The Education Committee has decided to recommend the City Council not to admit more than 80 new degree students at the Michaelmas term. There would be room, it is officially stated, for 240. According to one view, the question is whether the institution is to remain a college of University status, or fall to the rank of a technical school. The other view is that bright working youths of Manchester are losing the chance of technological instruction qualifying them for their trades, in order that the sons of the well-to-do from the whole of the North of England may obtain degrees, partly at the expense of Manchester's ratepayers.

Celebration of Demobilisation.—Last Saturday afternoon the Manchester Corporation Electricity (Installation) Department celebrated the demobilising of the ex-Service members of the staff. A char-à-banc tour was arranged into "Peakland," and tea was taken at Buxton.

Inquiries.—Makers of the Morse push-button for marine signalling, Whyte & Thomson patent; motors using the mark R. D. M. Co.; and ironclad switchgear marked "W.W.," are asked for.

INSTITUTION NOTES.

Diesel Engine Users' Association.—The subject of connecting-rod bolts was further discussed at the last meeting of the Association. Mr. J. L. Chaloner thought that a definite period might be fixed, after which a connecting rod bolt should be subjected to a careful examination by means of suitable measuring marks, and that it should then be left to the discretion of the chief engineer whether the bolt was to be renewed.

Mr. Geoffrey Porter referred to the desirability of calculating bolt sections on the basis of the elastic limit rather than on that of the ultimate stress.

Mr. G. W. F. Horner submitted a sketch of an arrangement he had made use of in carrying out a series of tensile tests with loading conditions similar to those set up in the bolts under discussion, and a series of diagrams giving the results of the tests. He said that heat treatment of steel bolts should be carried out by experienced persons, as it was very easy to obtain a high elastic limit and ultimate stress with a very low percentage elongation, and these were undesirable conditions. With regard to the packing

pieces between the halves of the big-end bearings, it was advisable to use one uniform thick piece rather than a few thin pieces.

In a communication, Mr. Charles Day gave the results of investigations which had been carried out at Stockport for some time past with regard to connecting-rod bolts. He said that the material should be heat-treated in the bar; the bar being of uniform section, internal strains were avoided, whereas when bolts were heat-treated there was a danger of such internal strains occurring at the bottom of the threads, and at any other parts where changes of section occurred. Mr. Day condemned the practice of drilling only one pin hole through a bolt in connection with the use of castellated nuts. The castellations should be as numerous as the diameter would permit, and several holes should be put through the bolt. With regard to renewal of bolts, he thought that any general recommendation was illogical. Certain bolts might work with safety for many years, whereas other bolts failed after a very short time, the failure being due to the bolts having been subjected to improper conditions. He described a method of marking bolts so as to permit of accurate measurements being taken which would show at any time if they had been stretched or twisted. Whenever a bolt had been materially stretched or twisted it should be rejected and replaced by a new one.

The President (Mr. Charles Gould) announced that at the following meeting of the Association, Mr. A. Abbott, of the Department of Scientific and Industrial Research, would address the members on the general scheme of the Research Association for Liquid Fuels.

The Tramways and Light Railways Association.—The twelfth annual congress of the Association is to be held in the Council Chamber, Caxton Hall, S.W. 1, on July 2nd, at 2.30 p.m.

Institute of Metals.—A lecture on "Recent Progress in Thermo-electricity" was delivered by Prof. C. A. F. Benedicks, Ph.D., of Stockholm University, before the Institute on June 10th.

Prof. Benedicks first gave a short summary of his theoretical views upon the metallic conduction of electricity, which explained many matters not made clear by the former electron theory. A consequence of this new theory was that one had to conclude that even in a single homogeneous metal thermoelectric currents did occur; hitherto such currents were believed to be produced only when two different metals were present. Prof. Benedicks gave a concise demonstration of the most important experimental evidence of the truth of this conclusion, utilising for this purpose various metals.

In liquid mercury it had been possible for him definitely to prove the existence of thermoelectric currents, thus disproving the negative results of previous workers. A consequence of what the lecturer termed his "homogeneous thermoelectric effect" was that there must exist the reverse effect, the "homogeneous electrothermic effect," including as a special case the well-known Thomson effect. The reality of this effect was duly made clear. A specially interesting demonstration was of a new rotating thermoelectric apparatus, made entirely of copper, and rotating in a magnetic field, the driving force originating solely from unequal heating (by means of a tiny gas jet) of thin strips of copper.

The point at which the new knowledge brought forward by Prof. Benedicks might have some practical interest lay in the possibility of reducing the thermal conductivity of metals by insulated sub-division into fine wires without impairing the electrical conductivity. The demonstrations were carried out with the aid of a galvanometer provided by the Cambridge & Paul Instrument Co.

Liverpool Wireless Association.—A meeting of the Association was held on June 9th. As many members are now joining who have had no previous experience in wireless telegraphy, considerable time was devoted to coaching and assisting the "raw recruits," and it is intended at each meeting to set apart a certain portion of time for dealing with the very elementary stages of wireless for the benefit of new members, in order to make the subject attractive and popular to both old members and beginners. New members are cordially invited, and should apply to Mr. S. Frith, hon. secretary, 6, Cambridge Road, Crosby, Liverpool.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Major PHILIP DAWSON, M.Inst.C.E., M.I.M.E., M.I.E.E., upon whom, as stated in our last issue, the King has conferred the honour of knighthood in recognition of his services rendered as a member of the Disposals Board of the Ministry of Munitions, has been a member of that Board practically since its inception. Sir Philip is a man of boundless energy and enthusiasm, and his public activities are manifold. To electrical men he is best known by reason of his standing as an expert on electric traction matters, with which he has been practically and intimately connected ever since electric tramway and railway work really began to develop in the British Isles. His reputation is world-wide through his authorship of many well-known text-books dealing with electric traction and power supply. He is a partner in the consulting engineering firm of Messrs. Kincaid, Waller, Manville & Dawson, of Westminster, who are intimately connected with dock, harbour, electric traction, and power developments in Great Britain, South and North America, India, and Australia. The new knight, who may be relied upon to worthily carry so high a distinction, is, of course, well known as consulting electrical engineer to the L.B. & S.C. Railway Co., and is responsible for its electrification. He is also responsible for that of the Great Eastern Railway Co. He is further a member of the Railway Electrification Advisory Committee of the Ministry of Transport, and was appointed by the President of the Board of Trade as a member of the Water Power Resources Committee. In 1919 he was created Chevallier de l'Ordre de Leopold by King Albert for technical services rendered in Belgium during the war. He is Vice-President of the Belgian Royal Commission appointed by the Belgian Government to investigate and report on the electrification of the Belgian State railways and on the unification of Belgian electric power supply; President of the Association des Ingenieurs Electriciens of the Institut Electrotechnique Montefiore, Liége. Among many local and general activities we note that Sir Philip is one of the members of the L.C.C. for West Lewisham, and is on the Housing, Highways, and Electricity Committees.

Mr. E. MORGAN, of Dewsbury, has been appointed technical and engineering assistant to the Wolverhampton electrical engineer, at a salary (including bonus) of £500 per annum, increasing to £550 after twelve months' satisfactory service.

Wakefield Electricity Committee recommends that Mr. H. G. FRASER be appointed acting city electrical engineer for twelve months, at a salary of £550 per annum.

Mr. S. M. G. TEAL has been appointed deputy chief engineer to the Calcutta Electricity Supply Corporation.

The marriage took place, on June 11th, at the Cathedral Church of St. Mary, Glasgow, of Major H. R. TUPPEN, M.C., A.M.I.E.E., of Tanners Manor, Horeham Road, near Eastbourne, and Miss Elizabeth Rhind, younger daughter of the late Mr. Andrew Rhind, C.M.E., Bengal-Nagpur Railway, India.

Taunton T.C. has fixed the salary of the electrical engineer (Mr. HOWARD) at £450, plus the civil service scale of bonus, making a total of £660 a year, instead of his present salary of £520.

Mr. W. T. TALLENT-BATEMAN, who about a year ago was appointed works manager to Messrs. Dorman & Smith, Ltd., of Manchester, manufacturers of switchgear and accessories, has recently joined the board of directors, at the same time retaining his position of works manager. Mr. Bateman was formerly chief switchgear engineer to the British Westinghouse Co.

Mr. F. L. WARD, station superintendent with the W.D. Central Power Station, Aldershot Command, has resigned his position to take up an appointment in Africa.

Mr. HARRY S. ELLIS, who recently resigned the position of borough electrical engineer at Southampton under circumstances with which our readers are familiar, is joining his brother, Mr. Arthur Ellis, of Cardiff, who is in practice as a consulting engineer. The business addresses of both gentlemen are: 9, Park Place, Cardiff (head office), and 103, Cannon Street, London, E.C. Mr. Arthur Ellis's business, which has already developed to a very considerable extent, embraces electricity supply, tramways and transport work, and Parliamentary matters. Mr. Harry Ellis has been connected with the profession for twenty years or so. Prior to going to Southampton, a year ago, he held important appointments at South Shields, Bradford and Cardiff, where he was identified with electrical and mechanical engineering in shipyards, textile mills, public supply and engineering undertakings. He is a M.I.E.E. and M.I.Mech.E., and was for some years a member of the committee of the Newcastle Section of the I.E.E.

The Albert Medal of the Royal Society of Arts for 1920 has been awarded to Mr. A. A. MICHELSON, For.Memb.R.S., Professor of Physics in the University of Chicago, whose optical inventions have rendered possible the reproduction of accurate metric standards, and have provided the means of carrying out measurements with a minute precision hitherto unobtainable.

Obituary.—MR. J. W. PAYTER.—Australian papers just to hand record the death in April of Mr. J. W. Payter, who died at his home at Toorak, at the age of 87 years. The deceased received the first cable message which reached Australia. He retired from the State Public Service 27 years ago. He spent 38 years in the service of the telegraph department, and had reached the position of co-manager at the time of his retirement. At the time of the Boer war he was conducting experiments in wireless telegraphy.

MR. J. T. CROWE.—We regret to record the death from pneumonia, after a very short illness, of Mr. John Tudor Crowe. Mr. Crowe, who passed away on Friday last at his residence at Crouch End, London, was 66 years of age. He was staff manager of the Eastern Telegraph Co., and was well known in the electrical industry.

MR. H. A. JONES.—The death has occurred, as the result of an accident, of Mr. Herbert Alexander Jones, electrical engineer, of St. Kilda, Queen's Road, Buckhurst Hill, Essex. Mr. Jones, who was 49 years of age, was cycling home from the West Essex golf links, when he collided with a motor car, and he died on June 7th from the injuries he sustained.

NEW COMPANIES REGISTERED.

H. W. Smith & Co. (1920), Ltd. (168,161).—Private company. Registered June 10th. Capital, £60,000 in £1 shares (50,000 cum. pref.). To take over the business of electrical wire and cable manufacturers carried on by H. W. Smith & Co., Ltd., at Lydbrook, Glos. The subscribers (each with one share) are: H. W. Hill, 74, Grantham Road, Stockwell, S.W.9, clerk; E. Newton, 3a, Marysville Terrace, Colney Hatch Lane, N.11, solicitor. The subscribers are to appoint the first directors. Registered office: Lydbrook, Glos.

A. H. Hunt, Ltd. 168,116).—Private company. Registered June 9th. Capital, £40,000 in £1 shares. To carry on the business of gas, electrical, and mechanical engineers, electricians, automobile and motor car engineers, &c. The first directors are: A. H. Hunt (permanent director and chairman), Court Green, Court Hill, Banstead; C. H. Hunt, Court Green, Court Hill, Banstead. Qualification, 5 shares. Registered office: H. A. H. Works: Tunstall Road, Croydon.

Newcastle Electrical & Motor Accessories, Ltd. (168,103).—Private company. Registered June 8th. Capital, £5,000 in £1 shares. To carry on business as indicated by the title. The first directors are: W. E. B. Dove, 45, Woodlands Terrace, Darlington, electrical engineer; J. Cowper, 19, Dean Street, Newcastle-on-Tyne; T. Sloan, 103, Shrotridge Terrace, Newcastle-on-Tyne. Solicitor: A. M. Tait, 46, Grainger Street, Newcastle-on-Tyne. Manager: G. G. Gorrill. Registered office: 39, High Bridge, Newcastle-on-Tyne.

New Italian Art Association, Ltd. (168,003).—Private company. Registered June 4th. Capital, £15,000 in 10,000 10 per cent. cumulative preference shares of £1 each and 100,000 ordinary shares of 1s. each. To take over the Italian Art Association, Ltd., and to carry on the business of importers and exporters of and dealers in works of art, and in particular marble, alabaster, and other materials used in the manufacture of electrical fittings, &c. The first directors are: Sir Alan Hutchings, K.B.E., 0, Grosvenor Street, W.1; Lieut.-Col. the Hon. E. Thesiger, D.S.O., 16, Prince of Wales Terrace, W.8; Major-Gen. P. E. F. Hobbs, C.B., C.M.G., Barnaboy, Farnborough Park, Hants.; G. H. Gascoigne, Moray House, Adelaide Road, Surbiton; Capt. the Baron George Marochetti, M.V.O., O.B.E., 60, South Audley Street, W.; Lieut.-Col. F. Lucas, O.B.E., 26, Stanhope Gardens, S.W.7. Secretary: P. H. Goodwin. Solicitors: Kenneth Brown & Co., Lennox House, Norfolk Street, W.C.

A.R. Engineering Co. (Southampton), Ltd. (167,986).—Private company. Registered June 4th. Capital, £1,000 in 5s. shares. To carry on the business of engineers, electricians, &c. The subscribers (each with one share) are: J. B. Webb, 1, Telford Avenue, S.W.2 (director of Anglo-Russian Engineering Co., Ltd., and the Anglo-Russian Engineering Co., Birmingham, Ltd.); H. J. Veitch, 56, Moorgate Street, E.C.2, chartered accountant. The first directors are: J. B. Webb (chairman), H. Walker, and A. E. Webb. Registered office: 126, High Street, Southampton.

Hartford Engineering Co., Ltd. (168,085).—Private company. Registered June 8th. Capital, £5,000 in £1 shares. To take over the business of the Hartford Engineering Co., now carried on under the proprietorship of the Southport Electrical Supply Co., Ltd. The subscribers (each with one share) are: W. Sharrock, 17, Dunkirk Road, Birkdale, engineer; G. Pendleton, 19, Bridge Street, Southport, confectioner. The first directors are to be appointed by the subscribers. Registered office: Pine Grove, Southport.

Bukwood Engineering Co., Ltd. (168,084).—Private company. Registered June 8th. Capital, £1,000 in £1 shares. To carry on the business of tool makers, general and electrical engineers, &c., to adopt an agreement with G. St. J. Wood, W. J. Butler, and H. S. Kemshead. The first directors are: G. St. J. Wood, 29, Gunterstone Road, West Kensington, W., electrical engineer; H. S. Kemshead, 70, Cranley Gardens, Palmers Green, N.13, engineer; W. J. Butler, 17, Wayland Avenue, Hackney. Registered office: 31a, St. Jude Street, Stoke Newington, N.16.

Durelco, Ltd. (167,994).—Registered June 4th. Capital, £300,000 in £1 shares. To acquire all or the majority of the shares in, and the undertakings of Duram, Ltd., Cryselco, Ltd., and Metal Manufacturers, Ltd., carrying on business in England, and to carry on the business of manufacturers of drawn wire and electric lamps, and all articles made of molybdenum and other metal, &c. The first directors are: W. L. T. Arkwright, J.P., 4, Wilbraham Mansions, Sloane Street, S.W.; the Earl of Kintore, 10, Park Place, St. James's, S.W.; P. H. G. Powell-Cotton, Quex Place, Birchington; Capt. E. G. S. Churchill, D.I., J.P., Northwick Park, Blockley, Worcs.; G. G. Craig, 10, New Square, Lincoln's Inn, W.C.; W. W. Worthington, J.P., Maple Hayes, Lichfield; J. C. Moulden, 19, Carew Road, Northwood, Middlesex. Qualification, £500. Remuneration (except managing directors) £400 each per annum (£100 extra for the chairman) and 5 per cent. of the net profits divided between them. Solicitors: Speechly, Mumford and Craig, 10, New Square, Lincoln's Inn, W.C. Registered office: Thanet House, 231-2, Strand, W.C.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Penrith Electric Supply Co., Ltd.—Deposit on May 12th, 1920, of deeds of land in Friar Street, Penrith, to secure all moneys due or to become due from company to Lloyds Bank, not exceeding £2,500.

Richmond Light Manufacturing Co., Ltd.—Debentures dated May 14th, 1920, to secure £2,500 charged on the company's undertaking and property, present and future, including uncalled capital. Holder: A. K. Fordham, 90, Cannon Street, E.C.

Switchgear & Cowans, Ltd.—Issue on June 1st, 1920, of £3,000 debentures, part of a series.

CITY NOTES.

Siemens Brothers & Co., Ltd.

The report for 1919, which was submitted at the annual meeting on June 8th, stated that the result of operations, despite the dislocation caused by the change over from war to civil work, was quite satisfactory. Valuable contracts, notably for submarine telegraph cables, were secured, and output was well maintained. The Stafford works of Siemens Brothers Dynamo Works, Ltd. (of which all the capital is held by this company), had been sold to the English Electric Co., Ltd., and an agreement had been entered into between the English Electric Co. and this company whereby each company would confine its manufactures and trade to particular lines of electrical plant, and would have the support and assistance of the other company in obtaining orders for such business. The cottage property at Stafford, standing among this company's assets at £53,344, had been included in the sale at that figure. The agreement for sale was entered into in November, 1919, but the property had only been legally conveyed in this year, so that the values in the balance sheet in respect of it remained undisturbed at December 31st last. The Dynamo Co. would continue its existence for the purpose of completing its contracts for dynamos and motors, and for carrying on its other electrical business. The profit for the year was £211,209, plus £244,567 brought forward, making £455,776; 10 per cent. dividend for the year requires £100,000; there is written off from the discount on the sale of debenture stock £25,000, put to reserve £15,000, and carried forward to 1920 (subject to excess profits duty for 1918 and 1919) £315,776. Lieut.-General Sir Hubert Gough has been elected to the board.

In the course of his speech at the annual meeting, Mr. G. Mure Ritchie said that the balance sheet showed the company to be in a generally healthy condition. The net profit was £211,209, compared with £229,647 for 1918. All sections of the business had contributed towards the profit, which represented an average of 10 per cent. on the total capital employed in the business and about 8 per cent. on the turnover. The dividends and appropriations would absorb altogether £140,000, leaving a sum of £71,209 out of the year's profits from which to pay the excess profits duty to which the company might be assessable for 1919. Adding to that the balance of £244,567 from 1918 there was an amount of £315,776 to carry forward. In regard to the sale of the Stafford works of the company, the transaction arose out of lengthy negotiations with the English Electric Co., Ltd. That company was engaged in the manufacture of machinery for lighting and power purposes, whilst Siemens Brothers' manufactures at their principal works at Woolwich mainly consisted of telegraph and telephone plant, and electrical cables. A similar class of work to that undertaken by the factories of the English Electric Co. was carried on at Stafford by Siemens Brothers Dynamo Works, but inasmuch as modern developments in electrical power plant steadily tended in the direction of the manufacture of larger and even larger units, it became obvious to the directors that that branch of the company's business, while superbly well equipped up to a certain point, would require, if it was to continue profitable in the future, to receive extensive additions both to the works and to the staff. Under existing conditions it would have taken several weeks to build and equip new workshops and train new men for the work, and the expenditure would have been very great, involving the issue of further capital. They had made a friendly business arrangement with the English Electric Co. for mutual support. The Stafford works were sold at a valuation made by Mr. Michael Faraday on behalf of the company, and the valuation showed a substantial balance over the book figures. Dealing with the manufacturing work of the company, the chairman said that owing to the diversion for nearly five years of cable manufacture to war purposes, the demand since the conclusion of peace for submarine telegraph and telephone cables was very large, and substantial contracts had been completed, or were still in hand, for both those classes of cable for various Governments and cable companies, among which might be named the Danish and Norwegian Governments, for whom they had made special types of inductance-loaded submarine cables of a larger capacity than any hitherto made, and for the manufacture of which the plant was specially designed and erected. For electric light and power cables the demand was great and was still growing, and their manufacturing facilities had been employed to the utmost. That had also occurred in the case of the output required of them for the development of the telephone service of the Post Office, for whom they had made and laid cables in a large number of towns in the Northern and Scottish districts. That contract had further given considerable employment outside the factory, as it had necessitated the opening up of the thoroughfares, the laying of conduits and pipes, and the installation of telephone cables in no less than 50 towns. Like all other industries they had had special difficulties to face arising from the ferment in the labour world, affecting, on the one hand, the adequate and prompt supply of their raw material which they required in very large quantities, and on the other, the preparation of tenders covering manufacture extending over lengthy periods in a way satisfactory to their shareholders and fair to their customers. They might claim that those difficulties had been met and conquered, and as far as lay in their power their relations with their own employés were maintained on a friendly and satisfactory footing through the assistance afforded to their various committees, charities, sports club, &c. Their cable ship "Faraday" after repairing the Direct United States Co.'s cable in the summer, was employed during the autumn and winter carrying freight, but was now back again on her regular work of cable laying. In reviewing the business transacted by the cable sales department during the past year, it could reasonably be said that the result of the trading might be considered very satisfactory, and the turnover of the department for the year had exceeded that of any pre-war year, not only in value but also in regard to

the quantity and output. Among the orders secured during the year, one of particular interest was the contract for the supply and erection of the cables for the electrification of the Great Western Railway from Shepherds Bush to Ealing. They had also been successful in obtaining several large orders from abroad for extra high tension cables. A very considerable increase had taken place in the sale of cable accessories and joint boxes, particularly in the latter, and although that shop was considerably enlarged during the year it was still kept fully occupied. Several large contracts had been entered into with corporations and municipalities for their requirements in those goods. The trading in rubber insulated wires and cables showed an increase over any pre-war year both in value and mileage, and the sales were steadily improving. Special attention might be drawn to their "Stannos" wires, which were now in great demand all over the kingdom, and another of their manufactures which called for special mention was ebonite. The quality of their ebonite had now attained a reputation second to none, and the demand far exceeded the supply. Steps were being taken to meet the situation, and they hoped in the near future to be in a position to satisfy the requirements of all their clients. The battery business had been fully maintained. The connection which they enjoyed prior to the war had in the majority of cases been re-established, and the demand for their batteries was increasing. The construction of overhead lines for telegraph and power purposes had been revived, and there was every sign of considerable business, especially in the construction of power transmission lines. In the early part of 1919 they had to face the task of diverting their efforts from the supply of war material to the supply of those goods for the manufacture of which their works were originally laid out, and in that they met with the same difficulties as other companies. Raw material was hard to get and it was often of inferior quality, and output was diminished by the general compulsory reduction in working hours. However, in spite of all those difficulties, and of the long delivery times which they necessitated, the demand for their products was so great as to rapidly fill their order book. Their business in telegraph apparatus had revived satisfactorily, and continued as before to be almost exclusively for export, their chief customers being foreign Governments or railway administrations. Their business in wireless telegraph installations took a considerable step forward during the year, and continued to develop satisfactorily. The Post Office had placed considerable orders for telephone exchanges, of which they had secured a fair share, having booked no less than three public exchanges during the year. In conclusion, he referred to the fact that arrangements had recently been made which would ensure the manufacturing output of their lamps being doubled in the near future. The increased cost of labour and raw materials had, he said, reduced the net profits in comparison with the turnover made by the lamp department last year to less than half of that realised during the preceding year. That fact should appease the minds of any who, through the sketchy accounts concerning the report of the Standing Committee on Trusts, which recently appeared in the daily Press, might have formed the opinion that the company was profiteering in lamps.

Lord Queenborough seconded the motion, which was adopted without discussion.

Electrical Construction Co., Ltd.

Presiding at the annual meeting, on June 10th, Mr. James Gray, the managing director, said the balance of profit and loss account showed a small reduction on that of last year. Having regard, however, to the fact that during the two previous years the works had been operating up to their full capacity, there could hardly fail to be some set-back in profits this year, due to reduced hours of labour and the restrictions prevailing as to overtime, &c. The extensions of the works did not add appreciably to the output during the year, and the moulders' strike caused great disorganisation. The effects of this strike were still felt, but would, it was hoped, soon be overcome; and a larger turnover than ever was anticipated, though it must be kept in view that labour conditions would tend to modify the effect of the extensions which had been carried out. Comparing the past two years, the gross profits from manufacturing and contracting in 1919-20 were £121,764, and in 1918-19 £121,364, the increase being £400. The net profit decreased from £68,680 in 1918-19 to £66,169 in 1919-20. These figures showed that though the gross profit was practically the same in each of the two years, the net profit last year was £2,561 less than in the preceding year. This was accounted for by an increase of £4,992 in general charges, though there was a set-off of £1,183 reduction in debenture interest and maintenance of plant and machinery, and also of £898 additional dividends and interest and transfer fees. Having regard to all the conditions, the results were quite satisfactory. The net profits were £66,169, and the sum brought forward (after payment of £20,000 excess profits duty for the year ended March 31st, 1919) was £18,669, making a total of £84,839. Referring to various items in the balance sheet, Mr. Gray explained that the reference to proceeds of sale of leasehold property at Millwall, £5,398, concerned premises which were formerly sublet to the Electrical Power Storage Co., but had since 1916 been in occupation of a shipping company, which had made an offer to purchase, and this had been accepted. "Additions to plant and buildings, £44,883," included the extension of the works to which reference had already been made. It consisted of three bays, measuring in the aggregate 330 ft. by 110 ft. The beneficial use of these was not obtained as early as anticipated, but the whole of the switchgear department had now been transferred to the new shops and a greatly increased output from that department would be possible. When the shops had been completed they would be second to none in the country in lay-out and equipment, both of which were vital to cheap production. The item shares in allied companies had been reduced considerably, advantage having been taken of favourable offers to purchase. The company was not a holding company, and the proceeds of the sale could be more profitably employed in its own business. The shares realised a surplus over their book value, and this was applied in reducing investments to market value. On the liability side, the ordinary capital had been increased by the issue made in April, 1919; the debentures had been reduced by £8,000. The general reserve, with the present allocation, would stand at £100,000, equal to one-third of the ordinary share capital. The floating assets exceeded the floating liabilities by £326,913; a most satisfactory position. With regard to the payment of excess profits tax, when the war broke out the manufacturing electrical industry was emerging from a long period of depression caused by strenuous and unfair foreign competition, and the excess profits duty had, therefore, weighed heavily upon the industry in consequence of low pre-war standards. In the case of their own company, the sums paid in excess profits duty and munition levies since their inception, had exceeded the dividends to the ordinary shareholders after deducting income tax. It would be difficult to find words more forcible than those used by the Chancellor of the Exchequer last year in favour of abolishing the duty, but to the surprise of the community he had not only decided to continue it, but to increase it from 40 to 60 per cent. Every reasonable person acknowledged that the money had to be found, and was willing to pay his share, but he objected to an unfair distribution of the burden. Excess profits duty was imposed in a time of stress and served its purpose, but to continue it was a direct encouragement to extravagance, and it would not conduce to increased production, which was vital to the rehabilitation of the country's finances. The labour outlook was still uncertain, but their relations with their own men were quite satisfactory, and provided there was no dislocation by strikes or otherwise, they might look forward with complete confidence to the results of the new financial year. The speaker referred to the valuable services rendered by the staff and workmen during the year.

The report was seconded by Sir Henry Mance, and unanimously adopted.

Altrincham Electric Supply, Ltd.

During 1919 109 new installations were connected, making the number of actual consumers 1,940. After providing for debenture interest, &c., the profit was £6,913, plus £284 brought forward. After paying the preference dividend, and putting £500 to depreciation, a dividend of 7½ per cent. per annum is to be paid on the ordinary shares for the half year ended December, and a dividend of 5s. per share for the year on the deferred shares. £517 is to be carried forward. The revenue for the year was somewhat disappointing, as the price that the company was able to charge for current for domestic purposes was not commensurate with the increased cost of labour and coal, and during the first half-year the operation of the Household Fuel and Lighting Order adversely affected the revenue.

The recovery of industrial activity in the area has been unexpectedly slow, and this, in addition to affecting the revenue from existing consumers of electrical power, has delayed the completion of new factories being erected in the district, and to which the company are already supplying a certain amount of power. When the fresh capital was issued in July, 1919, it was anticipated that the major part of it would be required at an early date in payments for the extensions to plant. It has not yet, however, been possible to obtain delivery of the major portion of this, including a 2,000-kw. turbo alternator. A large proportion of the new capital has therefore been practically unproductive, and has been invested for the time being in 5½ per cent. Treasury Bills, and the anticipated increased profit for the past year has, for this reason, not been realised. The Broadheath district is continuing to find favour as a manufacturing centre, and, unless unfortunate set backs occur, the directors look forward to satisfactory results for the current year's working.

Delhi Electric Tramways & Lighting Co., Ltd.—For 1919 the gross receipts of the tramway undertaking were £15,092, and those of the electric supply undertaking £32,498; increases of 1¾ per cent. and 13 per cent. respectively. The tramway revenue was affected by the disturbances which occurred in Delhi in April, 1919. The combined undertakings show a net revenue of £20,430, as compared with £18,010 in 1918. After providing for general expenditure, debenture interest, depreciation, putting £2,500 to renewals reserve, and writing £5,000 off preliminary expenses, 7 per cent., less income tax, is paid on the preferred and participating shares, and 1s. 4½d. per share, less tax, on the ordinary shares, and £1,362 is to be carried forward. Additions to plant amount to £3,073. Further plant, equipment, and mains required to meet the growing demands have been ordered, and the question of providing for future developments is receiving careful consideration.

Manila Electric Railroad & Lighting Corporation.—Dividend of 1½ per cent. on the common stock for the quarter ending June.

United Electric Tramways of Monte Video, Ltd.—The report for the year ended March 31st, 1920, states that the credit balance for the year to October, 1919 (the fiscal year of the Uruguayan company), after providing for administration expenses and debenture interest is £86,344, plus £10,669 brought forward. £4,961 is applied to redemption of debenture stock; £2,500 to redemption of preference and ordinary share capital; £30,000 to renewals and contingencies; 6 per cent., less tax, is paid on the cumulative preference shares in respect of the year to September 30th, 1918, and 6 per cent. is recommended on the same shares for the half-year to March, 1919, and for the year to March, 1920; carried forward £7,032. The operation of the tramway system showed gross receipts at an exchange of $4.7 to the £ of £443,694, an increase of £63,394. The operating expenses were increased by £29,823, leaving a net increase of £33,571. Passengers carried 54,883,919, an increase of 6,955,313. Car miles run 7,756,634, an increase of 718,207. The decrease in cost of fuel has been less than was hoped for a year ago, while expenditure on repairs, maintenance, and wages has continued to advance.

Calcutta Electric Tramways, Ltd.—Presiding at the annual meeting in London, on Monday last, Sir Henry Kimber, Bart., said that the capital outlay of the year, £9,671, was small as compared with the increased revenue earned. The traffic receipts increased by £39,581 on a mileage run increase of 21 per cent. The passengers carried increased by nearly 7 millions to 50 millions. They were now considering the question of overhauling the power house with a view to providing more up-to-date machinery or other facilities to meet the growing traffic. In regard to the prospects for the current year, the traffic receipts continued to improve, the increase to date being over 1¼ lakhs. In order to meet the growing morning and evening traffic they had ordered eight motor 'buses, which they hoped to have ready to start a service during the latter half of the year. The costs of running were, of course, much higher than those of the tramway service, but the experiment would be closely watched with a view to the extension of the service if it was warranted by results.

Prospectuses.—*A. Reyrolle & Co., Ltd.*—The prospectus has been advertised for the issue at par of 160,000 £1 ordinary shares in this well-known company of switchgear manufacturers. The demand for the company's product since the war has exceeded all previous records, both in quantity and value. The works at present cover five acres, and the employés number nearly 1,000. The proceeds of the present issue will be devoted to completing the extensions and providing working capital. Very full particulars were given in our advertising pages last week.

The lists will be closed on Saturday, June 19th, but applications received by post on Monday, June 21st, will receive consideration.

W. Canning & Co., Ltd.—The list is to close to-morrow, Saturday, in an issue of 200,000 ordinary shares of £1 each at par, in this company, which has been formed to acquire the old-established business of W. Canning & Co., of Birmingham and London, electro-platers' engineers, manufacturers of electro-plating plant and materials, &c. The issue will provide additional capital in respect of premises purchased in London, for extensions to meet increasing trade, and to enable the practice of carrying large stocks to be extended. Particulars of the registration appeared in our last issue (page 757).

Marconi's Wireless Telegraph Co., Ltd.—The report for 1919 shows that the credit balance of profit and loss account amounted to £1,220,740. The total distribution on the old ordinary shares is 25 per cent. for the year, on the preference 22 per cent., and a bonus of 5s. per share, without reduction of income tax, is to be paid on the old ordinary shares and on the preference shares.

Kalgoorlie Electric Power & Lighting Corporation, Ltd.—For 1919 there is a decreased profit. It fell from £10,622 in 1918 to £5,451 mainly on account of the closing down of the principal mines by reason of labour troubles. Since the strike ended early this year the returns have shown an improvement.

Lewes & District Electric Supply Co., Ltd.—Total revenue £5,013; working expenses £3,856; balance to net revenue £1,156. After meeting debenture interest, &c., and adding £868 brought forward, £600 is put to renewals fund, and £837 is carried forward.

Stock Exchange Notices.—The Committee has specially allowed dealings in the following under temporary regulation 4 (3):—

Mather & Platt, Ltd.—450,000 ordinary shares of £1 each, fully paid, Nos. 600,001 to 1,050,000.

La Plata Electric Tramways Co., Ltd.—After meeting debenture interest the net profit is £3,024, plus £7,628 brought forward. Both sums are to be carried forward.

Globe Telegraph & Trust Co., Ltd.—Dividend of 14s. per share on the ordinary shares, making 10 per cent. total for the year.

Lancashire Power Construction Co., Ltd.—Dividend at the rate of 6 per cent. per annum for 1919 on the ordinary shares.

Ruston & Hornsbys, Ltd.—Dividend on the ordinary shares at the rate of 5 per cent. per annum. To credit of employés' aid account, £1,000; £41,175 to depreciation on buildings, plant, and machinery; carried forward £37,240.

Companies to be struck off the Register.—The following is to be struck off the register within three months unless cause is shown to the contrary:—

Autoelectric Transmission, Ltd.

Coventry Chain Co., Ltd.—Interim dividend of 6 per cent. per annum, less tax, on the preference and ordinary shares for the half-year.

Howard & Bullough, Ltd.—Final dividend on the ordinary shares, making 10 per cent. for the year. £57,207 carried forward.

James Keith & Blackman Co., Ltd.—Dividend on ordinary shares for year ended March, 1920, at the rate of 20 per cent. per annum, free of tax. To reserve £13,780; forward £18,559.

C. A. Vandervell & Co., Ltd.—Dividend of 10 per cent. per annum, less tax, for the quarter ended June 30th on 10 per cent. preferred ordinary shares.

Provincial Tramways Co., Ltd.—Interim dividend of 8d. per ordinary share.

STOCKS AND SHARES.

Tuesday Evening.

The Stock Exchange is troubled with a good deal of selling from somewhat mysterious sources. Apparently the liquidation emanates from Paris, but it is so persistent and so heavy that suspicion arises as to whether some, at any rate, of the sales are inspired near home. The outlook in regard to money is unchanged, though there does seem to be some awakening on the part of the Government to the fact that trade will be much better served by cheaper money than it can be by the Bank Rate rising. Consequently, optimism is already beginning to talk about a fall, instead of a rise, in the Bank Rate, though the position is still sufficiently unsettled and obscure to cause hesitation on the part of investment or speculative enterprise.

There is a breath of improvement in the issues of the Underground Electric Railways Company, on the assumption that the company is bound to be allowed to put up its fares before very long, and that when this is done, the enormous volume of traffic handled will begin to make itself felt. As soon as profits do come into the picture, they should be on the substantial scale, and the speculative investor is prophesying a return, sooner or later, to the days when the Underground Company paid 6 per cent. on its income notes. For the next half-year, or the next few half-years, it may be safely conjectured that these Notes will receive considerably less than their proper dividend, but the price, in anticipation of the fare-raising being conceded, has hardened to 59½, while the shares at 1½ are ½ higher. The shilling shares, on the other hand, are easier at 4s. 6d.

The talk of serious financial trouble in Paris has caused Brazil Tractions to recede to 49. Other Brazilian issues are also dull and heavy, apparently in consequence of the delay which has occurred in allowing Brazilian companies to raise their freight rates. The strength of Anglo-Argentine Tramways is scarcely maintained, the first preference losing 2s. 6d. of the recent advance, but British Columbia deferred at 49½ and the preferred at 50½ are 4 and 2 points higher respectively. Mexican issues are no better. Indeed the tendency is for them to slide back, with the exception of Mexico Tramways 6 per cent. bonds, which have gained 2. The Calcutta Tramways raises its dividend from 8½ per cent. to 10 per cent., free of tax, and the price is firm at 7¾. The report is an excellent one. Bombay Electric Tramways preference at 13 are 5s. lower.

Of the new cable shares, Westerns are 4¾, Globes 4¼, Eastern Extensions 4 and Eastern Telegraphs 9s. 6d., with a fair amount of business doing in them all. Amongst the senior stocks, Eastern ordinary has given way to 147½, a fall of 3 points, and Eastern Extensions at 14½ are 10s. lower, though Westerns remain at 15¼. The principal excitement in this market, however, has been another rise in Marconis, the price putting on 3-16 to 3¼. The company's report is exceedingly good. The dividend is made up to 25 per cent. for the year on the ordinary shares, and these, together with the preference, receive in addition a bonus of 5s. per share paid free of tax. The market has been strong for some two or three weeks past, and the price has come up from 3 to 3¼ with scarcely a break. The new shares, which rank equally with the old as soon as the latter have received the dividends just declared, stand at 3¼, the same price as the preference shares, which are to receive 22 per cent., and the bonus just mentioned. Canadian Marconis are 10s. 3d. and Marines 38s. 9d., the latter showing a distinct disinclination to respond to the recent good report. No particular heed is paid in the Stock Exchange market to the strike of Marconi operators.

It may be well to point out that the calculation of the yield on Marconi shares, in our tabular list, takes no account of the 5s. bonus. The return is worked out on the 25 per cent. dividend only.

Amongst the manufacturing shares, Callenders have attracted a little attention and a rise of 1-16, in consequence of the new issue, while the report shows up well. It is interesting to notice the available balance during the past four years from 1916 onwards, and the annual figures are: £311,444, £207,491, £232,978, £262,803. For 1913, the year before the war, Callender's had £170,000 to dispose of, and the dividend then was 15 per cent., the same as it is in respect of the year just ended, the latter, of course, including the new shares distributed by way of bonus some time ago. Castner-Kellners are weak at 3¼ ex dividend. Babcocks at 2⅜ xd show little change, allowing for the deduction. Henleys have risen ⅛ to ¼. Siemens at 26s. show recovery of the 1s. dividend, while Telegraph Constructions are £1 lower at 21½ owing to monetary conditions.

Electricity Supply shares are unchanged, from Bromptons to Westminsters. Nobody is taking any interest in them. The strike which has plunged Melbourne into nightly darkness failed to influence the price of Melbourne Electric Supply shares. The rubber share market is quiet to dull, with the price of the commodity once more a trifle below 2s. per lb. Armament shares are weak, Vickers and Armstrongs both giving way on provincial sales. In these, as in many other of the Stock Exchange industrial departments, business is slow; prospective buyers profess that they prefer to wait and see whether the 60 per cent. E.P.D. will remain, or whether the continuance of vigorous attacks may force its partial abandonment even at this twenty-fifth hour.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1918.	Dividend 1919.	Price June 15, 1920.	Rise or fall.	Yield p.c.
HOME ELECTRICITY COMPANIES.					
Brompton Ordinary..	8	12	62	—	£9 8 2
Charing Cross Ordinary	4	7	92	—	9 6 8
do. do. do 4½ Pref. ..	4½	4½	2⅞	—	8 8 8
Chelsea..	8	4	2½	—	8 0 0
City of London	8	10	14	—	8 17 10
do. do. 6 per cent. Pref. ..	6	6	17/-	—	7 1 2
County of London	7	8	8½	—	9 17 0
do do. 6 per cent. Pref.	6	6	8½	—	7 5 5
Kensington Ordinary	6	7	4½	—	7 15 6
London Electric	Nil	2½	1½	—	6 0 0
do. do. 6 per cent. Pref...	6	6	8	—	10 0 0
Metropolitan..	5	6	2⅝	—	10 8 8
do. 4½ per cent. Pref. ..	4½	4½	2⅛	—	8 0 0
St. James' and Pall Mall	10	12	6½	—	8 16 10
South London	6	6	2⅝	—	9 12 0
South Metropolitan Pref.	7	7	18/9	—	7 0 0
Westminster Ordinary	8	10	5	—	10 0 0
TELEGRAPHS AND TELEPHONES.					
Anglo-Am. Tel. Pref.	6	6	77½	—	7 14 10
do. Def.	33/6	1½	18	—	8 6 8
Chile Telephone	6	6	6½	—	*4 12 2
Cuba Sub. Ord.	7	7	9½	—	*7 7 4
Eastern Extension	8	10	14½	— ⅛	*6 18 0
Eastern Tel. Ord.	8	10	147/8	−3	*6 15 7
Globe Tel. and T. Ord.	8	10	15½	—	*6 7 6
do. do. Pref.	6	6	8½	—	7 1 2
Great Northern Tel.	22	—	21½	—	9 15 6
Indo-European	18	10	55	—	7 2 10
Marconi	25	25	32	+ ⅛	6 18 0
Oriental Telephone Ord.	10	12	2⅞xd	—	*4 18 4
United R. Plate Tel.	6	8	7½	—	*5 6 8
West India and Panama	1/8	Nil	1/16	—	Nil
Western Telegraph..	6	10	15½	—	*8 9 0
HOME RAILS.					
Central London Ord. Assented ..	4	4	44½	—	8 19 9
Metropolitan	1	1½	19½	—	6 8 2
do. District	Nil	Nil	15	—	Nil
Underground Electric Ordinary..	Nil	Nil	1⅞	+ ⅛	Nil
do. do. "A" ..	Nil	Nil	4 6	−6d.	Nil
do. do. Income ..	5	4	59½	+1	6 14 6
FOREIGN TRAMS, &c.					
Anglo-Arg. Trams. First Pref. ..	Nil	5½	33	— ⅛	8 3 0
do. do. 2nd Pref. ..	Nil	Nil	8¼	—	—
do. do. 5 Deb. ..	6	5	60	+ ½	8 6 8
Brazil Tractions	Nil	—	49	−2	—
Bombay Electric Pref.	6	6	13	— ½	4 10 3
British Columbia Elec. Ry. Pfce.	5	5	57½	—	8 13 10
do. do. Preferrred	2½	5	50½	+2	9 18 6
do. do. Deferred	Nil	3	49½	+4	6 1 3
do. do. Deb. ..	4½	4½	62½	—	8 2 0
Mexico Trams 5 per cent. Bonds..	Nil	Nil	28½	—	Nil
do. 6 per cent. Bonds..	Nil	Nil	22½	+2	Nil
Mexican Light Common	Nil	Nil	12½	—	Nil
do. Pref.	Nil	Nil	19½	−2	Nil
do. 1st Bonds	Nil	Nil	42½	—	—
MANUFACTURING COMPANIES.					
Babcock & Wilcox	15	15	2⅜xd	—	*5 14 4
British Aluminium Ord.	10	10	1⅛	—	9 8 2
British Insulated Ord.	12½	15	1⅝	—	8 2 8
Callenders	25	15	1⅛	+ 1/16	9 12 0
.. .. 6½ Pref.	6½	6½	18/9	—	6 18 6
Castner Kellner	20	17	3¼xd	— ½	5 4 7
Crompton Ord.	10	—	22/-	—	9 1 10
Edison-Swan, "A"	10	—	1⅛	—	8 8 0
do. do. 5 per cent. Deb. ..	5	5	79½	—	6 5 9
Electric Construction	10	—	21/-	—	9 10 6
Gen. Elec. Pref.	6½	6½	18/6	—	7 0 5
do. Ord.	10	—	31/6	—	*6 8 0
Henley	26	15	1⅛	+ ⅛	8 0 9
do. 4½ Pref.	4½	4½	5½	—	6 18 6
India-Rubber..	10	—	13½	—	*7 11 0
Met.-Vickers Pref.	—	8	2⅝	—	6 18 6
Siemens Ord...	10	10	26/-xd	+1/-	*7 13 10
Telegraph Con.	20	20	21½	−1	*5 11 8

* Dividends paid free of Income Tax.

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and they may vary according to quantities and other circumstances.

Tuesday, June 15th.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Oxalic	per lb.	2/10	...
a Ammoniac Sal	per ton	£100	...
a Ammonia, Muriate (large crystal)	"	£92	...
a Bisulphide of Carbon	"	...	...
a Borax	"	£42	...
a Copper Sulphate	"	£48	...
a Potash, Chlorate	per lb.	1/-	...
a " Perchlorate	"	1/3	...
a Shellac	per cwt.	£31 10s.	30/- inc.
a Sulphate of Magnesia	per ton	£18	...
a Sulphur, Sublimed Flowers ...	"	£28	...
a " Lump	"	£25	...
a Soda, Chlorate	per lb.	6d.	...
a " Crystals	per ton	£12	...
a Sodium Bichromate, casks ...	per lb.	...	...
METALS, &c.			
g Babbitt's Metal Ingots	per ton	£113 to £345	
c Brass (rolled metal 2" to 12" basis)	per lb.	1/2½	½d. inc.
c " Tubes (solid drawn)... ...	"	1/5½ to 1/6	...
c " Wire, basis	"	1/3⅜	½d. inc.
c Copper Tubes (solid drawn) ...	"	1/8½	...
g " Bars (best selected) ...	per ton	£161	...
g " Sheet	"	£161	...
g " Rod	"	£161	...
d " (Electrolytic) Bars ...	"	£110	£1 inc.
d " " Sheets ...	"	£156	...
d " " Wire Rods..	"	£125	£1 inc.
d " " H.C. Wire ..	per lb.	1/4	...
f Ebonite Rod	"	3/-	...
f " Sheet	"	2/6	...
n German Silver Wire	"	3/-	...
h Gutta-percha, fine	"	13/-	...
h India-rubber, Para fine	"	2/1½	...
i Iron Pig (Cleveland Warrants) ...	per ton	Nom.	...
l " Wire, galv. No. 8, P.O. qual.	"	£59	£2 inc.
g Lead, English Pig	"	£35	£5 10s. dec.
g Mercury	per bot.	£21 to £21 10s.	£3 10s. inc.
e Mica (in original cases) small ...	per lb.	6d. to 4/6	...
e " " " medium ..	"	5/- to 10/-	...
e " " " large ...	"	12/6 to 25/- & up	...
g Phosphor Bronze, plain castings	"	1/6 to 1/1	...
g " " rolled bars and rods	"	2/2 to 2/6	...
g " " rolled strip & sheet	"	2/3 to 2/9	...
d Silicium Bronze Wire	per lb.	1/11½	...
r Steel, Magnet, in bars	"	1/8	...
g Tin, Block (English)	per ton	£233 to £239	£35 dec.
n " Wire, Nos. 1 to 16	per lb.	4/9	...
White Anti-friction Metals ...	per ton	£90 to £345	...

Quotations supplied by—

a G. Boor & Co.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
r W. F. Dennis & Co.

A "Meteorite Mystery."—On Wednesday, May 26th, there was an excetionally heavy thunderstorm at Chiswick, which was recorded in the Press under such headings as "Meteorite Mystery at Chiswick.—Strange Occurrence in Great Storm.—Fireball Seen to Fall," and was followed by a visit of "two eminent scientists" from the British Museum and Meteorological Office, to investigate. They doubted the meteoric cause of a hole in the ground that was found after the storm, but were said to be puzzled. The affair went the round of the Press—the terms "meteorite, fireball, thunderbolt" being applied.

Mr. Walter Betts, of Chiswick, informs us that visiting the scene at a convent on the Friday following the storm, he found a gardener filling in the hole. Close to the hole was a cemented path joined at right angles by a similar path from a paved courtyard, forming a sort of funnel with the outlet towards the hole. As from each direction there was a slight fall towards the corner where the hole was made, this spot would be the first soft and cultivated ground to be submerged by the direct downfall of rain thus collected. The roof-gutters overhanging the cemented paths would be overflowing, and two gutters meeting at the angle of the building just opposite the hole would form a pointed "jug-spout" from which the water would be projected on to the soft ground from a height of 18 or 20 ft. With such combined forces the soft soil would inevitably be washed out or down any subterranean hollow, such as an old drain. And so the hole can be accounted for. It was, in a double sense, a "wash-out." As to the "thunderbolt" itself, just before the great flash, a particularly dense cloud, at a low altitude, was approaching from the south-east. It probably passed over the convent, then, some 400 yards beyond, was discharged all at once with one tremendous flash and almost simultaneous clap. Mr. Betts's house, about three-quarters of a mile from the convent, was considerably shaken, and there was a torrential downpour of rain. After this abated, although the heavy rain continued for some time, there was not much lightning.

WHERE AMERICA LAGS BEHIND.

[COMMUNICATED.]

We are so used to having it dinned into our ears that America is the home of every electrical virtue, and has originated every worth-while improvement and development, that it may not be an easy task to make people believe that at least one of her feet is formed of unsubstantial clay, or (to employ a more appropriate simile), of bituminous compound.

In some ways America is ahead of this country electrically. The natural wealth, large population, and the important fact that a very big proportion of American buildings have been erected during the last 30 years, are sufficient to account for the wider use of electrical service on the other side of the herring pond. Electrically, America has not had to contend, as we have here, with a strongly entrenched and admirably organised gas industry, which has piped every town in the country, and has established a sort of dingy but sacred tradition in ninety-nine houses out of every hundred.

Apart, however, from the question of extent of use, America lags, in many ways, behind English practice. Particularly is this so in what may be called the refinements of electric lighting—the little contrivances which mean so much in the way of convenience and adaptability. With regard to switches, for example, America is apparently only just realising the superiority of the tumbler switch for ordinary domestic use. At least, one must infer this from recent advertising in American papers, calling attention to a new form of switch, which can be turned on with the elbow if the hands are otherwise engaged.

In small houses and apartments, and probably in some large ones, wall switches do not seem to be used at all. Instead, the fittings are equipped with pendant switches which have to be found and operated in the dark. This has led some clever person to place on the market phosphorescent pins or tabs which can be attached to the switches. It is extraordinary that, in a country which is supposed to be teeming with genius, such alarming stupidity should be exhibited in the use of electric lighting; that its outstanding advantage of easy control should go almost unregarded. No doubt it is a little cheaper to dispense with wall switches, but cheapness is certainly not the ruling motive of American industry; indeed, the general tendency is to spend a great deal of money in order to save a little time or work. As evidence of this, one has only to consider the enormous sales of electric washing machines at an average cost of about £40. The only probable explanation of America's deficiency in wall switches is that people have simply not realised the, one would have supposed, evident advantages of being able to control the light at the entrance rather than at the end of an adventurous and frequently damaging passage half-way across the room.

In the matter of wall plugs, too, the American user of electric light is unfortunately situated. At present there is a sort of crusade in progress, advocating the installation of what are called "base-board outlets." Reading the advertisements and booklets issued in support of this propaganda, one is forced to the conclusion that, in the average American household, small cooking appliances, fans, portable lamps, &c., are generally connected to the lampholders of ceiling fittings. As these lampholders are always of the Edison screw type, one can imagine the disproportionate amount of trouble involved in connecting up, say, a hot-plate or hair-drier which is only wanted for a few minutes.

One visualises the average American house as being replete with every conceivable sort of electrical appliance, from a washing machine to an electric chair for the removal of superfluous kittens; and if all these devices are connected to lampholders, our trans-Atlantic cousins must pass their lives amidst trailing clouds of flexible cord, using their lamps only on those rare occasions when the holders are not otherwise occupied.

With relief one notes that, as in the case of the switch, English practice is just beginning to find favour, and that a two-pin wall plug has recently been evolved. This, if generally used, will probably save a lot of time hitherto wasted in screwing home the absurd contraption at present employed. Unhappily, the American designer, although he had sufficient intelligence to see somewhat belatedly the advantages of the two-pin idea, seems to have made rather a bad job of the actual manufacture. Instead of providing substantial split pins, as in the English variety, he went in for thin brass strips which are bound to crumple up should one miss the holes at the first plunge.

America prides herself on her progress in the development of electric lighting fittings, and certainly in this respect her complacency is not altogether unjustified. Even in this department, however, she seems to have overlooked some of the small conveniences to which we in this country are accustomed. The counter-weight pendant, for example, is almost unknown in America; yet for certain purposes it is extraordinarily useful. It seems that the insurance companies are supposed to have some objection on the score of fire risk; but, as a matter of fact, this risk is practically non-existent. At any rate, the counter-weight is considered, and indeed has proved itself, to be entirely safe in this country.

It is possible that the Americans possess certain lighting conveniences of which we are as yet ignorant, but nothing they have could neutralise our advantage in the matter of intelligent switch design and location, and the free use of wall-plugs.

Apart from the lack of certain devices in America, there is also observable a degree of crudity and bad workmanship in electrical accessories which would be quite inconceivable in this country. Of course, many wiring accessories used in England are poorly made, but, in comparison with the fragility and unsound construction of the American varieties, they seem to be almost perfect. The threads of English lampholders, switches, &c., for instance, are often a source of irritation and delay, owing to insufficient tapering, but at least they *are* threaded and, once assembled, will remain so indefinitely. In the States, however, many devices, such as pendant switches, are made to fit together like a cigarette case or blacking tin. That is to say, there is no thread, the parts being kept together by the coincidence of a niche and a projection. Such a method of securing (save the mark!) the cover of an electrical device is simply abhorrent to the English mind.

To sum up, it may be said that America has advanced a great deal more than we have in the variety of its electrical applications, and in the degree of electrical saturation achieved in the larger towns. But no single wiring device has been perfected; while such matters as the design and convenient arrangement of switches and wall-plugs have been almost entirely ignored. The home of the multi-millionaire may be an Aladdin's cave of electrical delight, but the ordinary middle-class homes in America, although they may contain many heating and cleaning appliances rarely seen in this country, are a long way behind their English "opposite numbers" in respect of some of the elementary conveniences and refinements of electric lighting. In America, lighting seems to be a cheap and hastily arranged means of inducing the consumer to use an electric washing machine. In England, electric lighting is an end, and a very excellent end, in itself; although we must not, for that reason, allow ourselves to overlook the economic necessity of persuading the people of this favoured isle to use electricity for other purposes.

THE DESIGN OF A SUPER-POWER STATION.*

By H. GOODWIN, Junr., and A. R. SMITH, of the General Electric Co., U.S.A.

THE general tendency towards the consolidation of existing power plants and transmission systems and the probability of the construction of super-power lines will undoubtedly result in the erection of large generating stations which can be operated at practically full load throughout the year. Whether such plants be located near coal mines where fuel is reasonably cheap or in localities where the transportation cost of fuel is considerable, the fact that the load factor is high will justify the construction of a most economical plant.

Apart from the economy of fuel based entirely on its present value per ton, consideration must be given to its possible value many years hence. Another fact that is often lost sight of is that the more coal consumed per kilowatt-hour the greater must be the capacity of boilers, stokers, and coal and ash handling facilities; and the greater the steam consumption the larger the piping, condensers and water tunnels. In brief, the cost of much of the apparatus that is necessary only for economic reasons may be largely offset by the reduction in cost of the essential apparatus because of the reduced demands on it.

The design herein described was developed for a particular condition where some of the fundamental considerations were: High fuel cost, moderately good load factor, extreme river floods, and high voltage underground distribution. This design is of recent origin, and has therefore not been fully developed; consequently some of the apparatus shown, particularly the boilers, economisers and pre-heaters, are proposed designs.

The more unusual features of the design are:—

High steam pressure, 350 lb.
High superheat, 350 deg. F.
Independent power supply for station auxiliaries.
Air pre-heaters for stokers.
All auxiliaries electrically driven.
Minimum overhead coal storage.
Simplicity of boiler-room building.
Outdoor switchgear for 66,000-volt distribution.
Means of cleaning circulating water tunnels and possible utilisation of circulating pumps in case of flood.

The ratings of the principal pieces of apparatus are:—

Seven main generators of 35,000 KW., 0.8 p-f., 43,750 K.V.A. capacity at 13,200 volts, 3-phase, driven by steam turbines.

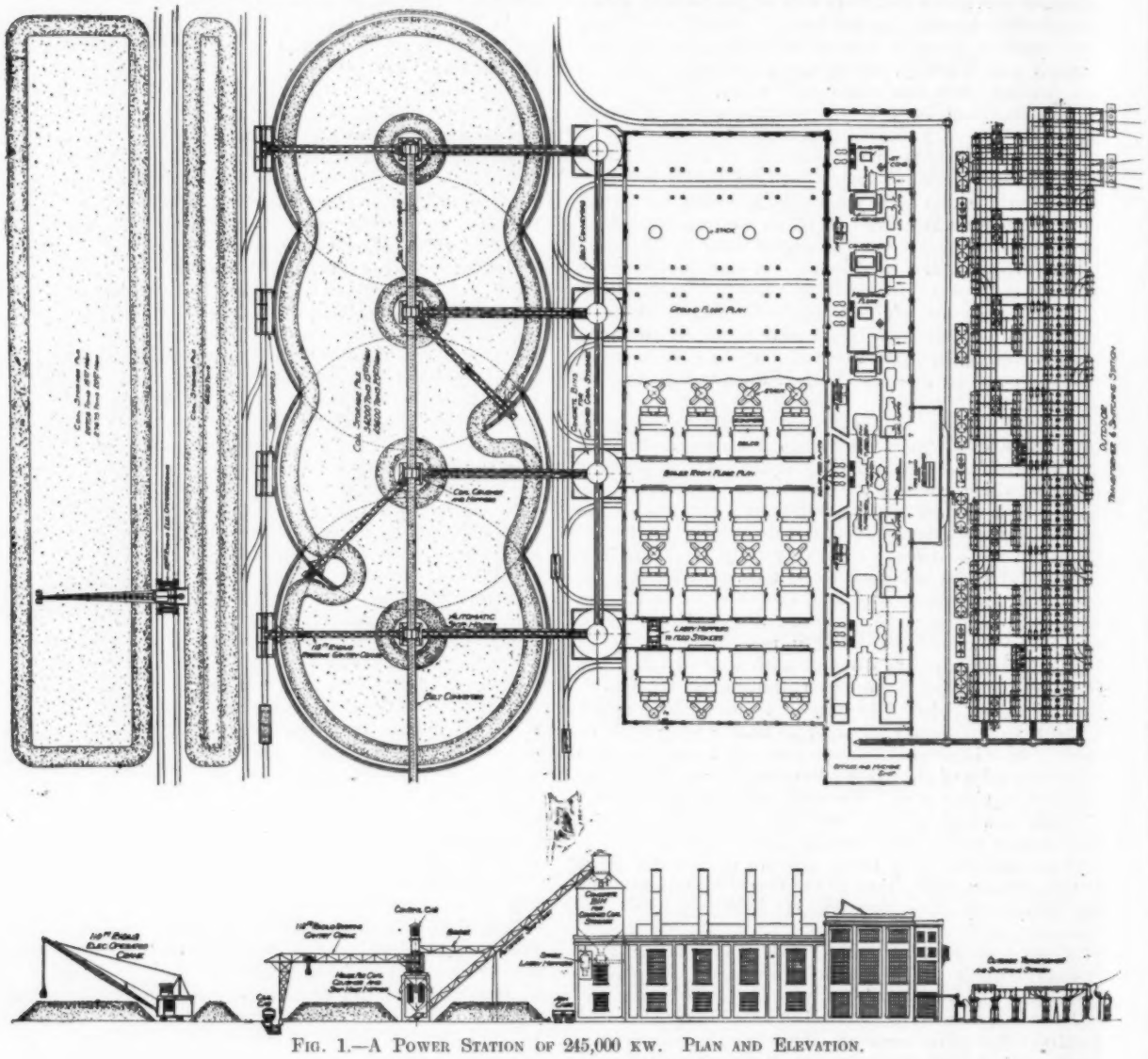


FIG. 1.—A POWER STATION OF 245,000 KW. PLAN AND ELEVATION.

Seven 45,000-K.V.A. transformer banks for stepping from generator voltage to 66,000 volts, each bank composed of three 15,000-K.V.A. single-phase units. One generator and one transformer bank are designated as reserve capacity.

Ten underground and two overhead feeders, all at 66,000 volts. The underground feeders will each be composed of three single-conductor underground lead-covered cables and will have an individual capacity of 45,000 K.V.A. The overhead feeder capacity is approximately 10,000 K.V.A. each.

The coal-handling equipment has been designed with the idea that the bulk of the coal will be unloaded from barges by means of travelling crane towers at the dock and transported by two belt conveyors directly to the four receiving hoppers and crushers. Fig. 1 shows the construction. There

* From the *General Electric Review*, May, 1920. Abstract.

are no travelling trippers, as all belts are dead-ended. From the receiving hopper the coal is delivered directly to the outside storage or through a crusher and skip hoist to the overhead outside bins. These overhead bins are connected by an emergency belt conveyor so that in case of failure of a skip hoist, a crusher, or any part of a receiving hopper tower, the crushed coal can be transported from the adjacent overhead bin.

The intention is that one operator located in a control cab above each receiving hopper will operate the revolving gantry crane, the crusher, the skip hoist, &c. Another operator will be located on each electrically operated larry to transport and weigh the coal from the overhead bins to each boiler. The emergency coal storage handled by the locomotive travelling crane will be operated only when the excess coal is being stored or reclaimed.

It will be observed that the revolving gantry crane reclaims the coal from the circular storage without moving the bridge; thus, this method is very rapid when reclaiming coal, although in distributing the coal the bridge will have to be moved slightly from time to time, but to minimise this movement outside shoots are shown on the four sides of each receiving hopper tower. The revolving gantry cranes overlap so that coal can be transferred from one pile to another. The design shown can be partially built and extended from time to time without interfering with operation, or without changing existing structures.

high price of fuel than by the high load factor. Where the load is uniform the stokers must have a greater relative combustion area.

With the use of economisers and preheaters, induced-draught fans will be necessary because of the increased draught loss and the low temperature of gas entering the stacks. These fans might be of the ordinary plate type, or possibly of the multi-vane type, because the temperature is low and the pressure comparatively high. However, the induction type of stack employing high-pressure blowers may be substituted.

Both the induced-draught fans and the stoker blowers are in duplicate for each boiler, although each would be of only half the maximum capacity required per boiler.

Wrought tube economisers of the same construction as the boilers, that is, with headers inclined with relation to the tubes, are proposed. The economisers will be practically the same width as the boilers; thus, there will be no change in the sectional area of the flue connecting the boiler and the economisers. The economisers will be cleaned with steam soot blowers instead of scrapers, and it is anticipated that there will be no moist soot deposit because the water entering the economisers will first be heated to 150 deg. or 160 deg. with exhaust steam, thus bringing the temperature well above the dew point of the gases.

Special attention is called to the natural thermo-siphon flow of water in both the vertical tubes and the headers,

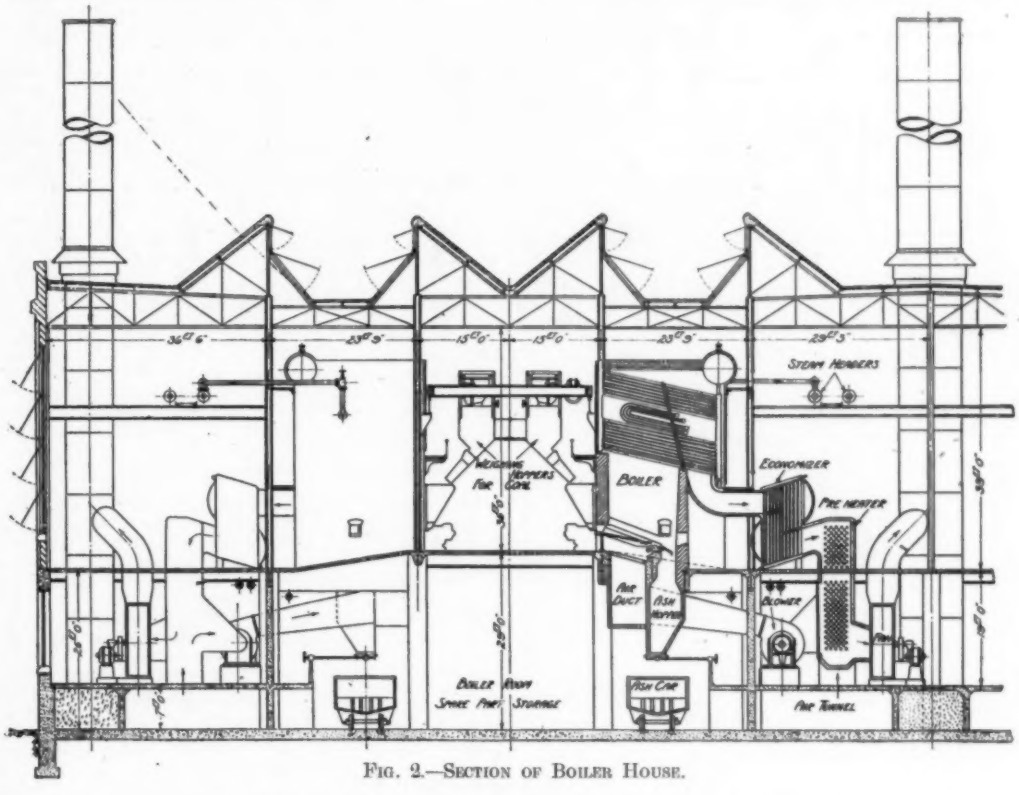


Fig. 2.—Section of Boiler House.

It is proposed to dispense with all kinds of ash conveyors, which are at best troublesome. The ash hopper under each boiler will be of such capacity as to contain 12 or 24 hours' storage so that ashes need be removed only once or twice during the day. The ash hoppers will empty directly into standard railroad cars, which will be hauled by a storage battery locomotive.

The boilers (shown in figs. 2 and 3) will have a rating of some 1,600 h.p. or 16,000 sq. ft. of heating surface. The proposed separation of the two banks of tubes with the superheater between is suggested for two reasons: First, to permit using a two-pass boiler and keep the economisers on the main floor, which means a greater number of tubes in height; second, to get a high amount of superheat without an excessive amount of superheat surface. The baffling of this boiler is simple. All of the heating surface should be effective, as there are no idle pockets, and the draught loss, because of the two passes instead of three, will probably be less in spite of the fact that the boilers may be several rows of tubes higher than the usual standard.

Four boilers per turbine are shown, but as there will be one spare turbine, there will naturally be four spare boilers, and some steam may have to be transmitted through the interconnecting steam header.

The "extra long" underfeed stoker has been shown, as the grate area must be commensurate with the increased heating surface resulting from a very high boiler. In this case the demand for economy was prompted more by the

and the counter-current flow of the gases and the water in the economisers; also, to the convenience of piping the feed water from the headers in the basement through the economisers to the boiler drums.

To avoid internal corrosion of the wrought steel economiser tubes, it is proposed to eliminate as completely as possible all air from the feed water, either in the condenser or between that and the economisers.

The air from each turbo-generator is discharged into a duct leading from the generator room to the end of the boiler house. This is shown clearly in fig. 3. The tunnel is shown in section in fig. 2. The far end of this duct, being open to the atmosphere, gives a free discharge for the generators in case no blowers are in operation, and any air required for the boilers over and above that supplied by the generator will be taken in at this end. From this main duct the air passes through the heating tubes in each preheater, the preheater being divided into two units per boiler to make a more practical design. With this arrangement the boilers nearest to the turbine room will burn the heated air discharged from the generators, whereas the boilers at the far end will burn the air from outside.

Preheaters have not been in general use in stationary plants, although they have been applied for many years on board ship. If the cost of coal is at all high, they can undoubtedly be made to show a good return on the investment.

On account of the high pressure and high superheat involved, it is proposed to simplify the steam piping as much

as possible. There are no steam headers in the general sense of the word, but there is a transfer header for equalising pressures and transferring steam between boiler rooms. The omission of all steam-driven auxiliaries except the house or auxiliary turbines, of which there is one for every two main units, greatly simplifies the steam piping, and materially reduces the cost of the plant.

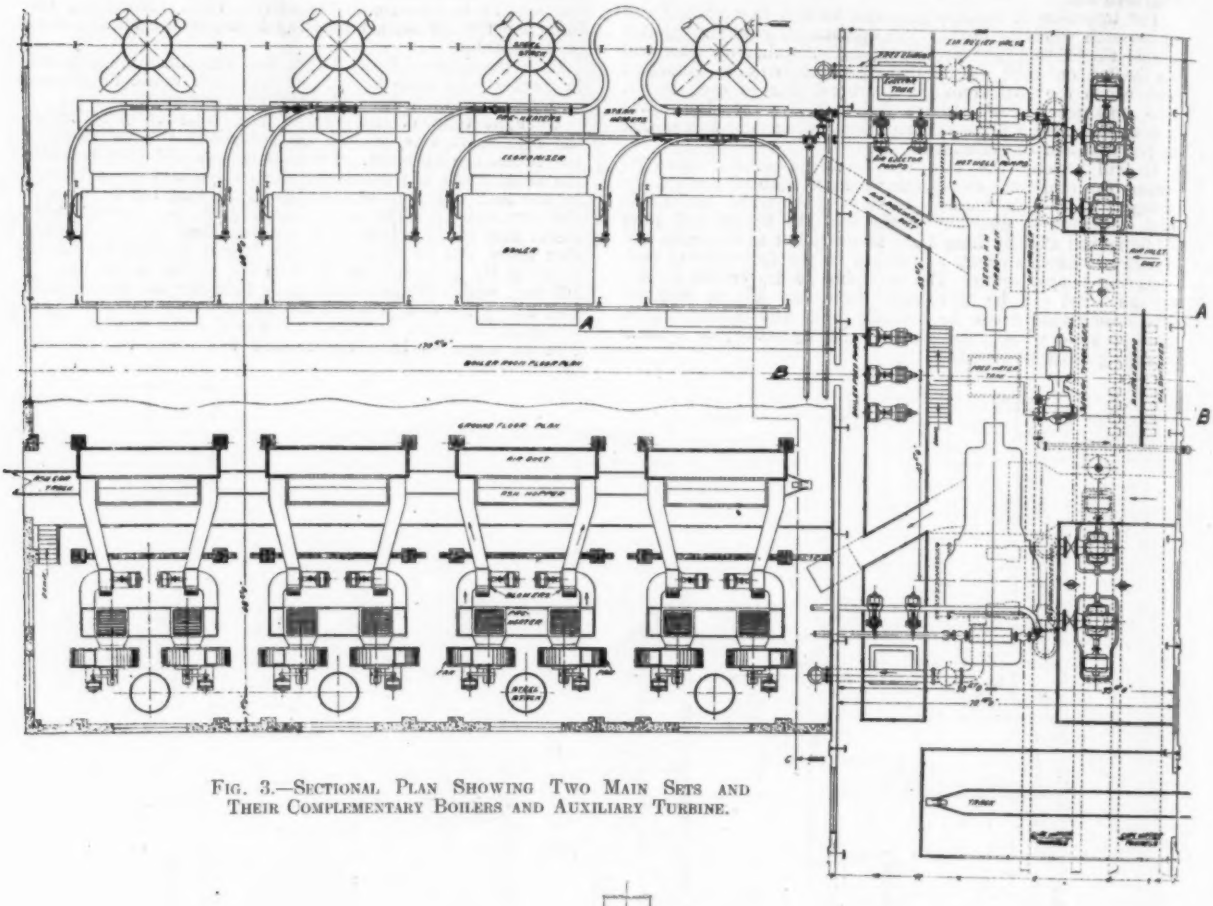


FIG. 3.—SECTIONAL PLAN SHOWING TWO MAIN SETS AND THEIR COMPLEMENTARY BOILERS AND AUXILIARY TURBINE.

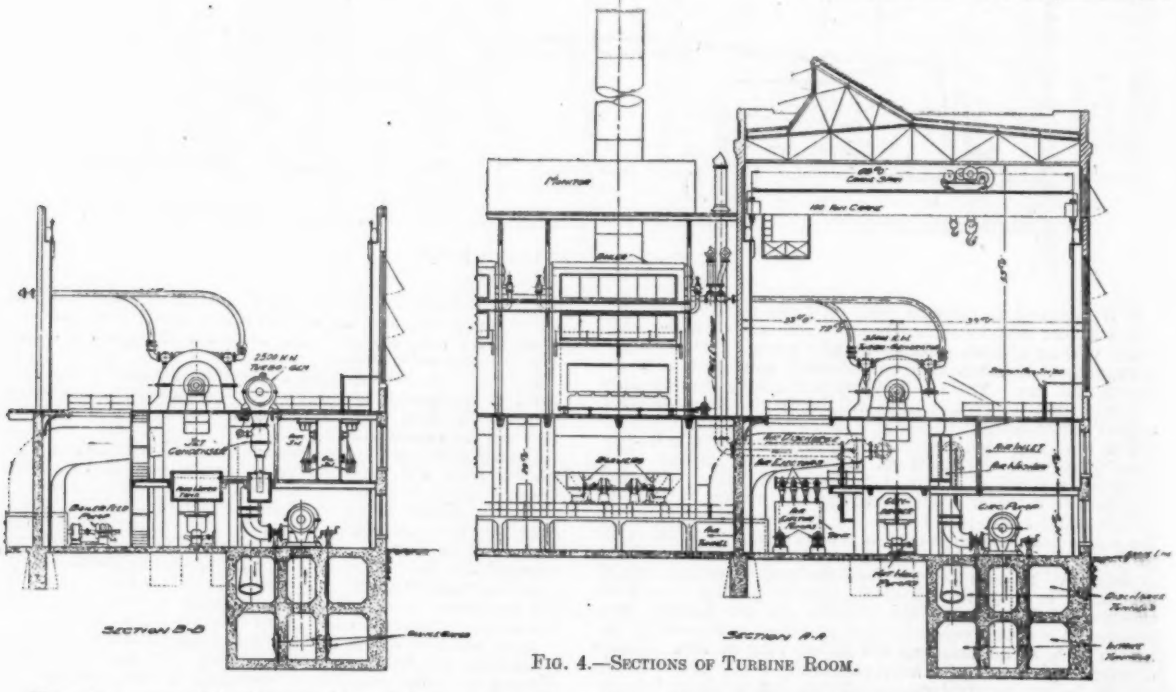


FIG. 4.—SECTIONS OF TURBINE ROOM.

There is a group of feed pumps for each boiler room. The piping, therefore, can be segregated in a most advantageous manner and the sizes of the pipes kept very small.

Fig. 4 shows a cross section of the turbine room, and below this the circulating-water tunnels. On account of the large size of these tunnels it appeared best to divide them into two parts. With two intake and two discharge tunnels they should be arranged so that either one can be taken out of service for cleaning or for repairs. This statement applies most forcibly to the intake tunnels, which invariably fill up with sand or silt. Sluice gates have therefore been shown connecting between the intake tunnels and a centre chamber. There is one centre chamber for each main turbo-generator; thus, any one or all the circulating pumps can get suction from either tunnel. In the event of a flood with the water entering the power station basement, any one or all of the circulating pumps could pump this drainage by simply closing the sluice gates on both sides of any or all of these centre chambers.

The discharge tunnels are connected together to reduce the head loss.

The very high steam temperature involved with 320 deg. F. superheat at 325 lb. gauge at the turbines practically precludes the use of any small steam-driven auxiliaries, such as boiler feed pumps, &c. Since the water in the boilers would be evaporated to a dangerous level in a very few minutes, were the boiler feed shut off, a most reliable source of power must be provided for the supply of boiler-feed water. Power for driving the feed pumps is not considered sufficiently reliable when supplied from the main bus-bars.

In order to provide a very reliable supply of power to drive all essential station auxiliaries electrically, it is proposed to use one 2,500-KW. auxiliary or house turbine for each pair of main turbines. Each house turbine will be provided with a low jet condenser which will normally produce about 15 inches of vacuum. The circulating water for this condenser is the condensate from the main units.

The auxiliary power and therefore the load on the house turbo-generator will not be proportional to the load on the main units; consequently, with a fluctuating quantity of circulating water the vacuum will tend to vary through a wide range. It is therefore intended that the house alternator be paralleled with the main bus so that a portion of the auxiliary load can be shifted automatically or manually from the house alternator to the main alternators to maintain a constant vacuum under all conditions. This electrical interconnection would be so made that a drop in potential or a lowering of the frequency, due to disturbances on the main system, would automatically disconnect the two and keep the auxiliaries connected to the house alternators.

In order to provide for a constant flow of water through the condenser of the house turbine, some of the water may be recirculated. In other words, if a condenser is designed for a quantity of water equivalent to ¾ load on two main units and only one main unit is in operation, the circulating pump for the house turbine condenser will recirculate half of the water. This condenser obviously serves as a feed-water heater. The tank shown just in front of the condenser (fig. 4) is a storage or surge tank for the boiler feed supply. This performs an important function, because it is impossible to feed the boilers at the same rate as the condensate is being returned from the main condensers. This surge tank therefore equalises the discrepancy and prevents overflowing of hot distilled water and the use of excessive cold, raw, or treated water.

The main condensers are of ordinary standard design, each being supplied with two circulating pumps, two hot-well pumps, and two air pumps. The hot-well pumps are each of full capacity. The others are of half the maximum capacity. It is expected that with a reasonably tight condenser system only one air pump will have to be operated at a time, and in case of very cold water one circulating pump will be sufficient. One circulating pump may give 60 per cent. to 70 per cent. of the capacity of two pumps, due to the reduction in condenser and pipe friction resulting from the reduced flow of water.

The condensers will be mounted on springs to take care of expansion and to avoid the introduction of an expensive and undesirable expansion joint between the turbine and the condenser.

All of the power supply for the less essential auxiliaries, such as cranes, coal lorries, conveyors, lighting, miscellaneous pumps, &c., will be from transformers connected to the main bus and supplied through a switchboard located in the first gallery. All the essential auxiliaries, such as condenser pumps, feed pumps, blowers, &c., will be controlled from switchboards located on the main turbine room floor at each auxiliary turbine. The operator at the switchboard will have immediate control of all the turbine-room auxiliaries within his vision and the control of the supply of power to all of the boiler-room auxiliaries supplying that particular section of the turbine room; thus, there will be four switchboard operators on the turbine room floor in addition to the main switchboard operators in the galleries.

(To be continued.)

British Canals.—The Development Department of the Sheffield Corporation is pursuing its programme of canal development, and is now making representations to the Ministry of Transport for the improvement of the canal system linking Sheffield with the Humber ports. The interest of Rotherham, Doncaster, Mexborough, and Thorne traders has been secured, and it is hoped that the necessary pressure may be placed upon the Government to secure the carrying out of the scheme. The proposal put forward is that the Sheffield and South Yorkshire Navigation shall be acquired by the Government or another public authority and that the canals which link the South Yorkshire industrial area through the Trent and Ouse with the Humber shall be widened and deepened to enable boats drawing 7 ft. of water and having a capacity of 110 tons to be used without the need of transhipment. The estimated cost of the improvement scheme is £1,750,000, and to this has to be added the purchase price for the Sheffield and South Yorkshire Navigation Co.'s Waterways.—*The Times.*

ECONOMICAL SUPPLY OF ELECTRIC POWER IN THE UNITED STATES.

A SUPER-POWER ZONE.

THE proposal that a super-power zone be created in the U.S.A. in a section of the North-East Atlantic seaboard, calls for the electrification of the railways and industries in this congested district, and for the installation of comparatively few large generating stations to economically supply the necessary electric power. This plan, and some of the engineering problems it involves, were presented at the mid-winter convention of the American I.E.E., held at New York in February last, in the form of a symposium, by ten of the leading consulting, designing, and power-plant engineers, and discussed by a number of others. The following details of the scheme are abstracted from *Power*. Mr. W. S. Murray briefly outlined the plan as providing a means by which a present estimated plant capacity of 17,000,000 H.P., divided into 10,000,000 for industrial purposes and 7,000,000 for the railroads, in a region 450 miles long, between Boston and Washington and extending inland from the coast 150 miles, now operated with a load factor not exceeding 15 per cent., could be lifted to a load factor greater than 50 per cent., and a means by which one ton of coal would do the work of two, and the railroads within the above zone and those carrying coal into that zone would be relieved of transporting one-half of the amount required for power and lighting purposes. The value of machine capacity from a utilisation standpoint would be increased from threefold to fourfold, and coal resources for the purpose named would be conserved twofold. This means that a present plant capacity of 17,000,000 H.P. can be replaced by one not greater than 5,500,000 H.P., and that not less than 30,000,000 tons of coal per annum can be saved, which at $5 per ton will represent $150,000,000 per year.

"Besides the foregoing savings, two great departments of economy will be created; one applying both to the railroads and industries, in the reduced cost of maintenance of machinery, and the other applying to the railroads alone in the reduction of train miles. It is estimated that these latter economies will effect a saving of another $150,000,000 annually, thus making a saving of $300,000,000. The foregoing are the direct savings as estimated from data collected from actual past operation o fthe specific order contemplated to be put into force in the zone under consideration.

"This plan offers immediate relief from the present intolerable congestion of our railroads by automatically increasing rail capacity without increasing track mileage, and reducing power equipment to a minimum; the present cargo space now required for industrial coal will be cut in half; train equipment in all classes will have its service practically doubled, and the present steam-power equipment, replaced by electrical equipment, can be transferred to other divisions where it is so vitally needed."

Mr. W. L. R. Emmet pointed out that "the best steam-turbine station equipment, operating under favourable conditions, can deliver a H.P.-hour in the form of electricity with an expenditure of one pound of coal, where four pounds are required to deliver a H.P.-hour to the draw bar of a good locomotive. While the comparison of efficiency between the large power station and the smaller engine or turbine equipment used in small stations and isolated plant is less striking than that with the locomotives, it is nevertheless highly unfavourable to the small plant."

Mr. J. F. Johnson expressed the opinion that "Reliability would have to be the first aim of the designer. Generating stations of some 200,000- to 300,000-KW. capacity, employing generating units of some 60,000- to 75,000-KW. capacity, each operated on steam conditions of 300-lb. pressure, 200 deg. F. superheat, and 29 in. vacuum referred to a barometer of 30 in., would involve no difficulties of design, construction, or operation, and from such stations a steam consumption rate of 10 lb. or less per KW.-hour and a total station rate of less than 1.5 lb. of good quality coal per KW.-hour output should be obtained."

Mr. H. G. Reist said: "So many generators of from 30,000 to 50,000 K.V.A. are at present in operation, giving satisfactory service, that there need be no hesitancy in considering generators as large as those now in use or larger. The potential of these generators should be within the limits of our experience; that is, not above 13,200 volts, and preferably lower, if this does not cause inconvenience in the lines leading from the generators to the step-up transformers. The losses may be expected to be less than 2 per cent. of the output of the machine. On account of the great capacity of the lines in such a large system, there may be some advantages in the use of induction generators. Roughly, the size of induction generators would probably be from 25 to 30 per cent. larger than a synchronous generator and the cost of the machine in proportion."

Mr. F. D. Newbury's point of view was that "the generating element in the proposed system does not involve anything new or untried. Any probable station could be designed with steam or electric generating units of a size now available. Suppose we assume a station of 300,000 to 500,000 KW. total capacity. We have available single-shaft generating units up to 40,000 KW. with generators of 50,000-K.V.A. capacity. The preferred speed for such units would be 1,200 R.P.M., 60 cycles. Eight to twelve such units would give the assumed

total station capacity. There have been developed and built triple-shaft compound units of 60,000 KW. Five to eight such units would constitute as large a station as has been suggested. All the generating units referred to are actually conservative in size, and by no means represent the largest unit of the speed in question that could be designed."

From a consideration of data available on railway operation, Mr. W. B. Potter draws the conclusions that "of the whole mileage included in the zone, a not very large proportion has been electrified. The traffic within the zone now handled by steam locomotives, if handled electrically, would require an average output of less than 750,000 KW., and if produced entirely by coal-burning electric power stations, would reduce the coal requirements for transportation purposes from 21,000,000 to 7,000,000 tons annually. As a certain proportion of electric power would be produced from hydraulic power stations, this coal requirement would be reduced in proportion as advantage is taken of hydraulic operations. The reduction in cost of maintaining the motive power units would be a large amount, which, estimated from the locomotive mileage, would be of the order of $15,000,000 or more annually.

Mr. Philip Torchio discussed the relative values of water versus steam-power development, and said: "The Western States, Mountain, and Pacific, have resources in both coal and water to meet indefinitely all the heat and power required from either source of supply, the potential water powers alone being large enough to supply over six times all the heat and power requirements in 1915. The other States, with corresponding heat and power requirements forty times greater than the Western States, have actually smaller resources in coal and potential water power, the latter capable of supplying only 8 per cent. of their total heat and

MAP SHOWING THE PROPOSED SUPER-POWER ZONE.

power requirements. It follows, then, that these States must indefinitely, as far as present human knowledge can foresee, depend upon the use of coal to supply the great bulk of these needs. These States, comparatively so deficient in water powers, consumed in 1915 528,000,000 tons of coal, about one-half for generating power and one-half for generating heat. They obtained an average efficiency from coal of 5 per cent. for the power and 50 per cent. for the heat."

In a comparison of the cost of steam power plant and hydroelectric developments, Mr. Torchio pointed out that the former cost about one-third to one-quarter that of the latter, consequently one dollar invested in steam plant would make available several times more power for industries than a dollar invested in hydroelectric plant. The author urged development of water powers especially in connection with electrochemical and metal refining processes using immense amounts of power continuously, where the net cost of hydro-electric power may be considerably less than steam power.

Mr. Percy H. Thomas assumed a transmission line extending from Lawrence, Mass., to Washington, D.C., operating at 250,000 volts, with tap lines running to the various sources of power and large centres of power consumption, and showed that it was within the scope of present engineering practice to construct and operate such a system. (See ELEC. REV., Sept. 19th, 1919, p. 371.)

Mr. J. W. Lieb called attention to the fact that an adequate power supply was one of the most important economical problems before the nation at the present time. The engineer should view the problem with a broad national outlook, and not make the mistake of the railroads by a battle over the different systems. The speaker referred to the question of both voltage and frequency making the problem involved, and illustrated this point by experience during the war, when New Jersey was short of power, and in New York City 100,000 H.P. was available, but could not be connected with New Jersey's power system on account of a difference of 2½ cycles between the two systems; this difference, however, no longer existed, since the New York Edison Co. had recently changed the frequency of its system from 62½ cycles to 60 cycles. Mr. Lieb laid great stress on the necessity of continuity of service, and said that in a community like New York City, the seriousness of interrupted service, even for a short time, would be impossible to exaggerate.

REVIEWS.

Wireless Transmission of Photographs. By MARCUS J. MARTIN. Second edition, revised and enlarged, 1919. 143 pages. London: Wireless Press, Ltd. Price 5s. net.

This book should prove of interest to two classes of readers. To the serious worker engaged in endeavouring to produce a commercially efficient method for the transmission of photographs by wireless telegraphy it gives an up-to-date account of the work which has already been done in this field, and suggests the lines along which progress might most profitably be made. On the other hand, to the amateur, who is, perhaps, not sufficiently trained in mathematics and physics to carry out quantitative experiments with wireless gear, and who finds, after he has constructed his ordinary wireless apparatus and used it for a little while, that his interest in the subject has begun to flag, it offers a new field in which his inventive talents and mechanical ingenuity can have full play, and of which he will be long in exhausting the possibilities.

The book is divided into five chapters, to which are added three appendices.

In the introductory chapter a brief account is given of the work which has already been done in the transmission of photographs over land-lines and cables, and of the difficulties which are met with due to the retarding effect of the capacity of the line. The second chapter deals with transmitting apparatus, and the third with receiving apparatus used for sending photographs by wireless telegraphy.

The problem of driving the transmitting and receiving gear in synchronism with one another is discussed in the fourth chapter, while in the fifth chapter a description is given of the "Telephograph," a system for the transmission of photographs by wireless telegraphy devised by the author. In addition, this chapter contains some useful information on the Nernst lamp, and on photographic films.

Appendix A deals with the construction and action of the selenium cell. In appendix B detailed instructions are given for the preparation of the photographs on metal plates, by which the actual transmission is controlled, and in appendix C a brief outline is given of the theory of the action of lenses as used in photography.

We notice, on page 57, when describing the receiving apparatus, in which the final reproduction of the image is brought about by means of a Bain chemical recorder, that the author expresses surprise that the point of the iron stylus used as the electrode shows signs of wear after it has been in use for some time. He remarks that "no explanation of this peculiarity on the part of the stylus can be given, as there is nothing very corrosive in the solution used, and the pressure of the stylus upon the paper is so slight as to be almost negligible." We do not think that any of our readers with a knowledge of the elementary facts of electrolysis will share in the author's wonderment at the wearing away of the stylus!

There is very little else in the book which we have to criticise. The printing is good, the descriptions of the various pieces of apparatus and the diagrams are clear, and anyone with a small workshop at his disposal should be able to make most of the apparatus required to carry out experiments in this fascinating branch of wireless telegraphy.

Graphical and Mechanical Computation. By JOSEPH LIPKA, Ph.D. London: Chapman & Hall, Ltd. Price 18s. 6d.

This book describes how to draw up alignment charts (also called nomographic charts or abaci) of all types, and should be of use to engineers and designers whose work entails the solution of equations or formulæ such as Hazen's for the

velocity of water flowing in pipes, $v = c\,\mu^{0.63}\,(h/l)^{0.54}$, where v = the velocity, μ = hydraulic mean depth, h = height, l=length, h/l=slope of pipe; c is a constant depending on the material of the pipe. To calculate v numerically, c, μ, and h/l being given, is laborious. If a nomographic chart is drawn, the values of any two quantities can be read off at once when the other quantities are given.

The author explains how various types of chart, *i.e.*, plain, Z, V, &c., can be drawn. Twenty-nine detailed charts are given, such as those for giving deflection of beams, adiabatic expansion of gases, flow of water according to various formulæ, discharge of gases through an orifice, H.P. transmitted by belting, &c. Chapter I deals with scales, ordinary slide rules, log—log rules, circular slide rules, &c. Chapter II deals with log paper and solution of equations by co-ordinate paper; some of the methods of solution and types of graph are seldom used or mentioned in the English technical Press. Chapters III, IV and V deal with nomographic charts; this forms the most important portion of the book.

The well-known chart for finding the combined resistance of two or more parallel resistance paths is given on pages 41 and 104.

To assist engineers in drawing up charts, two sheets of transparent paper, one with uniform scaling and with square root scaling and one with log scaling are enclosed in the book. These types of scaling can thus easily be marked off on lines less than 25 cm. long, and charts can be quickly made. On page 107 the author explains the derivation of charts with curved lines, representing formulæ such as $Q = 3.33\,(B - 0.2h)\,h^{3/2}$ where Q=quantity of water, B=width of weir, h=head of water. Many examples are worked out, and many exercises are given for students to practise upon.

Chapter VI describes the deduction of empirical formulæ to represent observed data, and the determination of suitable constants either by selection of particular points, or by averages or by the method of least squares. The figures showing typical parabolas, hyperbolas, exponential curves, and $y = x\,(a + bx)$ curves, may be of use in suggesting a solution to engineers who are not familiar with the aspect of such curves, when they are trying to find the law of a curve to represent a set of physical observations.

On page 152 *ff*, the derivation of constants in equations of the form $y = a + bx + c\,e^{dx}$, and $y = a\,e^{bx} + c\,e^{dx}$, is described exhaustively.

At the end of Chapter VI are 47 examples, observed values of data from various engineering tests are quoted (along with the type of law underlying them in some cases). The student has to deduce the numerical values of the constants for himself. These exercises will be valuable for students. Chapter VII deals with the derivation of numerical coefficients of periodic curves by means of Fourier's series. References are given to other papers and books on the subject and to mechanical harmonic analysers, two of which are described in fair detail.

Chapter VIII deals with interpolation, by graphical estimation, by the use of successive differentiation and then by Newton's interpolation formula, and Lagrange's formula.

Chapter IX deals with numerical integration and differentiation, and mentions various mechanisms for performing such work. This subject is more widely known than the alignment charts dealt with in the earlier portions of the book, but should be of considerable use for reference when dealing graphically with the results of tests and observations.

It might have been convenient if in addition to footnotes, references to books had been collected in one place; the index though fairly complete, might have a few additional entries giving directly the reference to charts, viz., "water flow," or "flow of water," pages 58, 109, &c., instead of only being referred to under "Charts."—A. B. Eason.

Education and Training for the Electrical and Allied Engineering Industries. Pp. 64. 1920. London: Edwin Arnold. Price 3s. 6d. net.

This little book is the Report of the Education Committee of the British Electrical and Allied Manufacturers' Association, which was appointed during the war by the Council of the Association with directions to consider the whole subject of technical education in the electrical and allied industries, and to suggest a uniform system. The committee consisted of ten representatives of various sections of these industries, of whom the chairman was Mr. A. P. M. Fleming, C.B.E., who has for several years shepherded the apprentices of what is now the Metropolitan-Vickers Electrical Co., Ltd.

The work occupied a little less than two years, and when it is considered that nearly every manufacturing firm of importance has devoted a great deal of thought to this important question, and that many have taken action, necessarily independent, on the lines which appeared best to themselves, it will be agreed that the co-ordination of this "immense amount of unrelated work" (to use the words of the preface), and its presentation to the public in permanent form, has been accomplished in a remarkably short space of time.

The individuals who are intended to be brought within the scope of the scheme are classified into: (1) Trade apprentices; (2) engineering apprentices; (3) student apprentices; and (4) research apprentices. These are to be trained respectively to become: (1) Skilled workmen, foremen, &c.; (2) members of engineering, commercial, erecting, drafting, testing, or other staffs; (3) senior officers of the same staffs; and (4) members of the research staff.

The several classes of apprentice are to be drawn from different classes of educational establishment, ranging from the primary school to the university, and at various ages between 14 and 22 years. The research apprentices would be selected from the student apprentices, and given a post-graduate research course.

The importance of careful selection is duly emphasised, and the organisation of games, so that team-work in after life may not be unfamiliar, is recommended. It is pointed out that practical training is a vital necessity in every case.

The situation as regards scholarships is surveyed, and recommendations are made that more should be founded. This is in agreement with the policy we have for many years advocated, and we feel that if the industry in general, and the British industry in particular, is to make the strides which in the whole world's interest it ought to make, it is an essential condition that in no case shall talent be withheld or diverted by reason of the lack of pecuniary support for its development.

The committee has arrived at a somewhat strange conclusion in paragraph 65, page 43: "Hitherto the scholarship system in Great Britain has been directed almost exclusively towards encouraging students to enter the so-called learned professions —law, medicine, teaching, and the Church. Scholarships founded in recent years for the express purpose of encouraging those engaged in industry to obtain technical training have frequently merely provided recruits for the staffs of technical institutions and universities." No doubt evidence was brought before the committee which appeared to justify this view, but there are very many individuals engaged in industry who owe their technical training entirely to the facilities provided by scholarships. It is, of course, only to be expected that the older branches of learning should be more adequately provided for in this respect, but we think it highly probable that the technical engineers engaged in industry who are scholarship men outnumber considerably the whole of the technical teachers of the country. The proportion of scholarship-trained teachers is doubtless higher than the proportion of scholarship-trained engineers, but this does not prove the accuracy of the committee's conclusion, and we should like to see more of the facts—if any—on which it was based.

With the recommendations for a uniform system we are in cordial agreement, and the B.E.A.M.A. is to be congratulated on having produced a report which, if acted upon, will exercise a great influence on the future of our industry.

Principles of Radiotelegraphy. By C. M. Jansky. London: Hill Publishing Co. Price 8s. 6d. net.

This is a well-compiled work of some 236 pages and 179 illustrations in eleven chapters. The general get up is in accordance with the usual high standard of the McGraw-Hill Co. The opening chapters deal with elementary electric and magnetic principles, tersely but quite effectively. The subject of electric waves is reached in Chapter V, and is dealt with in a way that is calculated to appeal well to students. The method of explanation of waves as pulses thrown along electric strain lines in a field of force is, however, open to some criticism, and perhaps rather dangerous to students. The strength of an electric field is, in general, proportional to the inverse cube of the distance from the charge, whilst wave intensity is only as the inverse square. Wave energy travels to distances and reaches positions from which the electric lines are completely cut off. Wave motion along the electric lines is therefore not a good explanation. Elementary alternating current theory is dealt with in Chapter VI, and the remaining chapters deal with subjects which may be properly regarded as immediately concerning radiotelegraphy. The distinguishing characteristics of different methods and systems of wireless telegraphy are fairly well treated, but expressions occur occasionally which require modification. For instance, on page 182, the energy radiated *per second* from an antenna is said to be 14.3 kw. The final chapter deals satisfactorily with the vacuum tube as a receiver and amplifier, though the author seems to be rather over imbued with the electron theory of electric currents without adequate grounds.—J.E.T.

Iron Losses in A.C. Fields.—It is not always possible to eliminate all iron parts from high-frequency apparatus. The losses in iron exposed to such fields have been examined, according to the German Physical Society, by producing the field in a coil into the field of which iron parts could be brought. The coil and iron parts were immersed in a calorimeter for the determination of the losses. It was found that placing a sheet of iron of 315 mm. diameter and 2.6 mm. thickness in front of one end of the coil 16 mm. from the end of the coil increased the effective resistance of the coil to 2.3 times its value without the iron, and the insertion of an iron tube of 3 cm. diameter and 2.6 mm. thickness into the interior of the coil increased the effective resistance seven-fold. The coating of the sheet of iron with a deposit of 0.3 mm. of copper, or 0.1 mm. of zinc eliminated the additional losses completely.—*Technical Review.*

EXPORTS AND IMPORTS OF ELECTRICAL GOODS FOR MAY, 1920.

The May returns of electrical business show considerably increased values in the export section, as compared with the previous month, and an increase of, roughly, £50,000 on the March total of £1,102,781.

The electrical exports for May reached the total value of £1,150,234, as compared with £940,014 for April, an increase of £210,220. This excellent result is largely accounted for by the increase in insulated wire exports of £147,000; telephone and telegraph cable and apparatus, £40,000; and electrical goods, £35,000; while batteries, meters, and lamp exports reached higher values than in April, machinery exports fell off in value to the extent of about £40,000.

The electrical imports for the month were valued at £193,255, as compared with £189,597 for April, decreases occurring in batteries, machinery, and telegraph and telephone imports, but in other directions increased values obtained.

The re-exports for May at £18,699 show a slight increase on the previous month's total of £15,494.

The total weight of electrical machinery exported during the month amounted to 697 tons, as compared with 1,102 tons in April, and 809 tons in May, 1919, and 2,347 tons in May, 1913.

VALUES OF ELECTRICAL EXPORTS AND IMPORTS FOR MAY, 1920.

	Exports.	Imports.	Re-exports.
Electrical goods and apparatus (unenumerated)	£162,583	£61,092	£8,507
Insulated wire	413,350	17,705	1,572
Glow lamps	20,511	6,169	308
Arc lamps and parts	2,620	1,224	230
Batteries...	48,514	3,273	22
Meters	44,170	5,048	328
Carbons	10,687	8,694	1,626
Electrical machinery :—			
Railway and tramway motors...	6,577	—	—
Other motors and generators ...	83,875	—	—
Elec. machinery (unenumerated)	54,572	61,838	2,786
Switchboards (not telegraph or telephone)	5,174	20	—
Telegraph and telephone cable and apparatus :—			
Telegraph and telephone wires and cables (not submarine)...	98,621	254	—
Submarine telegraph and telephone cables	107,527	—	—
Telegraph and telephone instruments and apparatus ...	91,453	7,938	3,320
	£1,150,234	£193,255	£18,699

NEW PATENTS APPLIED FOR, 1920.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by MESSRS. SEFTON-JONES, O'DELL AND STEPHENS, Chartered Patent Agents, 285, High Holborn, London, W.C. 1.

14,721. "Electric fuses." G. AUSTIN. May 31st.
14,732. "Method for generating electrical energy." R. NORRBY. May 31st. (Sweden, February 24th.)
14,741. "Sound-wave amplifying devices." E. G. BEKEN, T. E. B. CHALMERS and F. R. SWINBURNE. May 31st.
14,759. "Duplex electric ignition systems for internal-combustion engines." E. E. EDWARDS. May 31st.
14,770. "Electric lamp for cycles." R. FRAUENFELDER. May 31st. (Switzerland, July 23rd, 1919.)
14,774. "Electric meters." BRITISH THOMSON-HOUSTON CO. (General Electric Co.). May 31st.
14,775. "Manufacture of incandescent electric lamps." BRITISH THOMSON-HOUSTON CO. (General Electric Co.). May 31st.
14,802. "Electric water-heaters." L. J. SCHNEIDER. May 31st.
14,807. "Supports for filaments for thermionic valves." H. MORRIS-AIREY, A. K. MACROBIE and G. SHEARING. May 31st.
14,812. "Means for electrically reciprocating hammers, pistons, plungers, &c., for rock drilling, &c." G. F. D. CAMPBELL, J. KNIGHT and J. TATTERSALL. June 1st.
14,815. "Arrangement for automatically indicating train arrivals and departure, &c." AUTOMATIC TELEPHONE MANUFACTURING CO. June 1st.
14,829. "Electrical plug-and-socket switches." J. A. CRABTREE. June 1st.
14,832. "Fittings for erection of screwed tubing in electrical installations." G. A. COTTON. June 1st.
14,838. "Driving gear for ignition magnetos." ALBION MOTOR CAR CO. June 1st.
14,849. "Wristlet electric light." F. T. BARROW and L. A. DAYLEY. June 1st.
14,870. "Combined electric switch and plug coupling." G. MARR. June 1st.
14,873. "Electric switches." REMY ELECTRIC CO. June 1st. (United States, June 11th, 1919.)
14,891. "Ignition device for internal-combustion engine." OESTERREICHISCHE WAFFENFABRIKS-GES. June 1st. (Austria, February 15th, 1917.)
14,899. "Relay-contact and method of making same." F. L. DODGSON. June 1st.
14,900. "Train control system." F. L. DODGSON. June 1st.
14,979. "Protective systems." BRITISH THOMSON-HOUSTON CO. (General Electric Co.). June 2nd.
14,986. "Mine signalling systems." W. C. DAVEY and STERLING TELEPHONE & ELECTRIC CO. June 2nd.
14,995. "Electric signalling systems." WESTERN ELECTRIC CO. June 2nd. (United States, September 20th, 1918.)
14,998. "Electrically heated tubes, muffles, &c." MORGAN CRUCIBLE CO. and G. I. PAYNE. June 2nd.
15,010. "Apparatus for cooling electrodes." SIEMENS-SCHUCKERTWERKE. June 2nd. (Germany, June 4th, 1918.)
15,018. "Electric lamps." J. D. DRYSDALE (Crickmay). June 2nd.
15,050. "Galvanic batteries." G. FULLER and FULLER'S UNITED ELECTRIC WORKS. June 3rd.
15,075. "Electro-magnetic relays." CREED & CO. and T. LENAGHAN. June 3rd.
15,076. "Telephone systems." CREED & CO. and T. LENAGHAN. June 3rd.
15,083. "Impulse-transmitters for telephone systems, &c." F. BAKER and SIEMENS BROS. & CO. June 3rd.
15,089. "Protective mountings for electrical apparatus." WESTERN ELECTRIC CO. June 3rd. (United States, November 24th, 1917.)
15,111. "Tool for electric cable stripping." E. A. CLAREMONT and G. H. SCHOLES. June 3rd.
15,120. "Electrodes for vacuum tubes, &c." L. GUINET. June 3rd. (France, December 26th, 1918.)
15,124. "Sparking plugs." BREWSTER-GOLDSMITH CORPORATION. June 3rd. (United States, June 9th, 1919.)
15,129. "Manufacture of electric incandescent lamps." E. R. GOOTE. June 3rd.
15,137. "Electrical power-transmission systems." A. M. TAYLOR. June 4th.
15,180. "Electrically-operated indicator or annunciator." L. DE M. G. FERREIRA and SIEMENS BROS. & CO. June 4th.
15,188. "Electric arc welding, &c., and electrodes therefor." C. J. HOLSLAG. June 4th.
15,190. "Modulated wireless, &c., signalling systems." N. LEA and RADIO COMMUNICATION CO. June 4th.
15,196. "Electric foot and food heater and vaporiser." L. A. EDWARDS. June 4th.
15,202. "Reactance or choke coils." F. E. BERRY. June 4th.
15,205. "Galvanic batteries." G. & J. OLDHAM. June 4th.
15,206. "Electric lamps to be carried on the person." G. & J. OLDHAM. June 4th.
15,210. "Telephone exchange systems." WESTERN ELECTRIC CO. June 4th. (United States, August 23rd, 1919.)
15,222. "X-ray plant." G. HUBERS. June 4th. (Germany, March 27th, 1916.)
15,223. "X-ray plant." G. HUBERS. June 4th. (Germany, Aril 8th, 1916.)
15,245. "Electric switches." J. D. SPARK. June 5th.
15,253. "Electric fuse carriers, &c." BRITISH INSULATED & HELSBY CABLES, LTD., and E. HONNOR. June 5th.
15,258. "Telephone systems." WESTERN ELECTRIC CO. June 5th. (United States, January 24th, 1919.).
15,274. "Land, line, and wireless telephony." W. H. NOTTAGE. June 5th.
15,276. "Filaments, &c." BRITISH THOMSON-HOUSTON CO. June 5th.
15,283. "Alternating-current measuring-instruments." CHAMBERLAIN & HOOKHAM and S. JAMES. June 5th.
15,286. "Cathodes for electrolysers." J. F. WEBB. June 5th.

PUBLISHED SPECIFICATIONS.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1918.

18,915. WIRELESS-SIGNALLING APPARATUS. A. A. Hall. November 18th, 1918. (142,886.)

1919.

955. ELECTRIC INDICATING, MEASURING AND REGULATING APPARATUS. J. C. Todman. January 14th, 1919. (142,900.)
3,642. MANUFACTURE OF ELECTRODES FOR SOLDERING AND DEPOSITING METALS BY THE ELECTRIC ARC. E. H. Jones and Alloy Welding Processes, Ltd. February 14th, 1919. (142,934.)
3,711. LAMP TELEPHONE RELAYS. M. Latour. February 14th, 1918. (Addition to 140,506.) (142,937.)
7,175. ELECTRICAL CONTACTORS OR SWITCHES. W. Brooke and E. M. Kerr. March 22nd, 1919. (142,976.)
8,469. LIGHTING OF THE ELECTRIC LAMPS OF BICYCLES AND THE LIKE MACHINES. C. J. Hamilton. April 4th, 1919. (142,983.)
9,453. DYNAMO-ELECTRIC MACHINES. A. A. Price. April 14th, 1919. (142,994.)
10,179. APPARATUS FOR ELECTROLYSING LIQUIDS. J. S. Withers. (National Electro-Products, Ltd.) April 23rd, 1919. (143,002.)
11,304. LAMP FITTINGS. A. H. Midgley and Vandervell & Co. May 6th, 1919. (143,021.)
12,313. SIGNAL AND LIGHT REPEATERS AND CIRCUITS. A. W. Szlumper and W. J. Thorrowgood. May 16th, 1919. (143,033.)
12,412. IGNITION APPLIANCES FOR INTERNAL-COMBUSTION ENGINES. T. H. Martyn. May 16th, 1919. (143,038.)
12,925. METHOD OF AND APPARATUS FOR RECEIVING RADIO-SIGNALS. Marconi Wireless Telegraph Co. February 7th, 1919. (138,586.)
12,985. IGNITION SYSTEM FOR INTERNAL-COMBUSTION ENGINES. M. S. Conner and C. C. Puckette. May 23rd, 1919. (143,047.)
13,022. ELECTRIC LAMPHOLDERS. D. Assersohn. May 23rd, 1919. (143,048.)
14,684. ELECTRICAL ENGINE-STARTING DEVICES. S. T. Henn and Rushmores, Ltd. June 10th, 1919. (Cognate application 30,851/19.) (143,063.)
15,140. ELECTRICAL ENGINE-STARTING DEVICES. S. T. Henn and Rushmores, Ltd. June 16th, 1919. (143,068.)
15,270. JUNCTION BOXES FOR ELECTRIC CABLES AND THE LIKE. T. S. Jones, W. A. Mortimer and E. Jones. June 18th, 1919. (143,069.)
16,077. ELECTRICALLY-HEATED CLOTHES-PRESSING MACHINES. M. Cohen. June 26th, 1919. (143,081.)
16,154. APPARATUS FOR ELECTROLYSING LIQUIDS. J. S. Withers (National Electro-Products, Ltd.). June 26th, 1919. (143,083.)
16,378. SPARKING PLUGS FOR IGNITION PURPOSES. P. J. Barker and C. F. Willis. June 30th, 1919. (143,085.)
17,215. MAGNETIC ATTACHMENT FOR ENGINES. H. L. Keun. July 9th, 1919. (143,092.)
18,525. ELECTRICALLY-OPERATED DIAPHRAGM HORNS. H. W. Bradbury. July 25th, 1919. (143,098.)
19,997. RULING AND BLOTTING DEVICE. G. Whitehead. August 14th, 1919. (143,106.)
20,387. TELEPHONE EXCHANGE SYSTEMS. Western Electric Co. and G. Deakin. August 19th, 1919. (143,108.)
21,876. ELECTRIC PLUGS. H. N. H. Cobbold and Porthholme Aircraft Co. September 5th, 1919. (143,115.)
26,493. ELECTRIC MACHINES SUCH AS MAGNETOS, DYNAMOS, MOTORS AND THE LIKE. F. J. S. Jones. October 28th, 1919. (143,138.)
29,626. ELECTRIC AND OTHER LIGHT FITTINGS. A. and H. R. Hardie. November 27th, 1919. (143,152.)
31,169. ELECTRIC SPARKING PLUG FOR INTERNAL-COMBUSTION ENGINES. P. C. Grosjean. November 14th, 1918. (136,567.)
32,770. MEANS FOR MEASURING ALTERNATING ELECTRIC CURRENTS. M. B. Fields. December 31st, 1919. (143,160.)
32,886. APPARATUS FOR THE ELECTROLYSIS OF METAL-SALT SOLUTION. Fredriksstad Elektrokemiske Fabriker Aktieselskabet, F. E. F. February 13th, 1919. (138,862.)

1920.

4,231. DISTRIBUTING DEVICES FOR HIGH-TENSION IGNITION MACHINES. R. Bosch Akt. Ges. March 9th, 1918. (138,913.)
5,907. DEVICE FOR ATTACHING ELECTRIC CONDUCTING WIRES TO PIPES, RODS, AND SUCH LIKE. G. Turnock. February 27th, 1920. (143,172.)
8,118. DEVICE FOR LUBRICATING THE BEARING OF THE DISTRIBUTOR-SHAFT OF AN IGNITION APPARATUS FOR INTERNAL-COMBUSTION ENGINES. R. Bosch Akt. Ges. May 10th, 1919. (143,175.)
9,997. ELECTRIC FURNACES. W. E. Moore. February 14th, 1919. (Divided application on 3,693/19.) (143,176.)